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Volume 63

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The CANADIAN FIELD-NATURALIST

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PLANTS OF THE EDMONTON DISTRICT OF THE PROVINCE OF ALBERTA [1]

GEORGE H. TURNER
Fort Saskatchewan, Alberta

THIS LIST consists mostly of plants collected by myself since 1929 within a radius of about fifty miles of the city of Edmonton. Its preparation was suggested by Mr. A. E. Porsild, Chief Botanist of the National Herbarium, Ottawa, in Sept., 1945, after an inspection of my herbarium. I am much indebted to him for determinations of many plants and for much encouragement and advice.

Professor E. H. Moss of the University of Alberta who also read this list has added to it about thirty species from this district, mostly collected by himself and preserved in the herbarium of the University of Alberta, Edmonton. These have been incorporated, with proper acknowledgements in each case. I am indebted to him also for much help and encouragement in botanical matters over many years.

The Edmonton district includes some of the best agricultural land of the Canadian West, and is, perhaps, the most densely populated part of Alberta. The soil for the most part is a deep, black loam and the summer rainfall is from ten to thirteen inches. It is part of the most westerly of the three great terraces or plateaus that constitute the Plains Region between the Great Lakes and the foothills of the Rockies, sometimes known as the Missouri Coteau, and extends across our southern border far into the United States. The elevation at Edmonton is about 2100 feet above sea level.

Prior to settlement, the Edmonton area was largely wooded with aspen *(Populus tremuloides* Michx.) and balsam poplar *(Populus tacamahaca* Mill.) mixed with willow species. Many spaces of open, grassy land existed between the popular bluffs. A few white birch *(Betula papyrifera* Marsh., and its var. *humilis)* and white spruce *(Picea glauca* (Moench) Voss.) grew along the streams and lakes.

About 14 miles north of Fort Saskatchewan, where I have my home for many years, is a series of sandhills about two miles in width running from northwest to southeast across the district. They are largely covered by jack pine *(Pinus Banksiana* Lamb.) but contain numerous swamps, bogs, and muskegs, on which grow tamarack *(Larix laricina* (Du Roi) Koch), black spruce *(Picea mariana* (Mill.) B.S.P.) and numerous species of willow. A much smaller area of sandhill country, the Scotford Sandhills, lies on the south side of the North Saskatchewan River, beginning about four miles north and four miles east of Fort Saskatchewan. In these areas were found many species not noted elsewhere in the district.

The arable land in this area has almost all been cleared and is now devoted to grain and fodder crops. The river banks are still wooded.

Small areas of sandy soil are found in other parts of the district as are occasional patches of hard clay soil, locally known as "gumbo".

The Sturgeon River flows into the North Saskatchewan River 5 miles northeast of Fort Saskatchewan. Several lakes occur in the district; the nearest is Elk Island Lake, in Elk Island Park, about 15 miles east of Fort Saskatchewan; Lily Lake, a small body of water about two miles long and a half mile wide, is about 20 miles northwest of The Fort and nearly 30 miles north of Edmonton, and has proved of uncommon interest from the botanist's point of view. Davis Lake, 4 miles southeast of Fort Saskatchewan, is one half mile long and one eighth mile wide.

Special mention should be made of a tiny area at the mouth of "Whitemud Creek" immediately west of South Edmonton. Several tiny streams of rust-colored water gush

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from the high east bank of the little valley of this creek, forming a few pools and a small marshy area. Along these streamlets are tufa-like deposits replete with impressions of the leaves and other parts of modern plants. A few rods to the east and on higher ground is a series of three marly flats (presumably the reason for the name of the creek) only partially covered by vegetation. I have collected a considerable number of species at "Whitemud" that have not been found elsewhere in the Edmonton district. Among these are:

Cypripedium passerinum, Pinguicula vulgaris, Tofieldia glutinosa, Salix fallax, Malaxis unifolia, Allium Schoenoprasum, Carex viridula, Carex capillaris, Selaginella selaginoides and *Antennaria pulcherrima.*

Determination of the plants in this list have almost all been checked by prominent botanists such as those on the staffs of the National Herbarium, Ottawa, and the Department of Agriculture, Ottawa; special groups have been checked also by the late Professor W. P. Fraser, by Dr. Carleton R. Ball, Dr. F. J. Hermann, Mr. J. Swallen, Professor E. H. Moss, Mr. W. C. McCalla, Dr. G. F. Ledingham, Mr. J. W. Eastham, Dr. J. F. Brenckle, Dr. H. M. Raup and others to whom my great debt is hereby gratefully acknowledged.

On several occasions I did a little collecting around Lake de May to which a few references will be made in the catalogue. This lake is about 40 miles southeast of Edmonton and 12 miles north of Camrose. Fort Saskatchewan is about 14 miles northeast of Edmonton.

OPHIOGLOSSACEAE

Botrychium Lunaria (L.) Sw. Rare in low, rich woods and found only twice in the 16 years I have collected in Alberta. Fort Saskatchewan, 1112 and 3587.

B. multifidum (Gmel.) Rupr. Occasional in poplar woods. Fort Sask. 2084, 3651 and 3673.

B. **virginianum** (L.) Sw. var. **europaeum** Angstr. In rich, low woods. The commonest of the three species. Fort Sask., 1113, 3263, 3584, 4608, and 4730. Scotford Sandhills, 9 miles northeast, 1901.

POLYPODIACEAE

Dryopteris cristata (L.) A. Gray. Found by me only in one spot, in shade of trees on low ground in Elk Island Park, 20 miles east of Fort Saskatchewan, 3167.

D. spinulosa (O. F. Mueller) Kuntze. Found in Elk Island Park, 3133 and 3168, and in Sandhills, 15 miles north of Fort Saskatchewan, 4397.

Phegopteris Dryopteris (L.) Fee. Groat Ravine, Edmonton, 4241. Elk Island Park, 1109.

Cystopteris fragilis (L.) Bernh. Low ground under willow, Scotford Sandhills (9 miles northeast of Fort Saskatchewan), 4415. Groat Ravine, Edmonton, 4240.

Pteretis nodulosa (Michx.) Nieu. Found only in the valley of the Sturgeon River, ⅛ mile above its mouth where it was plentiful, 1111 and 1110, and at Pigeon Lake, 5036.

EQUISETACEAE

Equisetum affine Engelm. *(E. hyemale* L. var. *affine* (Engelm.) A.A.Eat.). Common where subsoil moisture is plentiful. Fort Saskatchewan, 47, 46, 45, 44.

E. arvense L. Common on moist soils, Fort Saskatchewan, 40 and 39.

Equisetum fluviatile L. Occasional in bogs, Sandhills, 15 miles north of Fort Saskatchewan, 30 and 31.

E. kansanum Schaffner. Occasional in wet areas. Fort Saskatchewan, 41, 42 and 43.

E. palustre L. *E. palustre* L. var. *americanum* Victorin). Abundant in some places along wet river-shore. Fort Saskatchewan, 4718, 1845, 34 and 35.

E. pratense Ehrh. Plentiful in low poplar woods of the river valley adjoining Fort Saskatchewan, 38.

E. scirpoides Michx. On moist, shaded ground. Not common. Sandhills 15 miles north of Fort Saskatchewan, 49.

E. sylvaticum L. Found only on wooded edge of muskeg in Sandhills 15 miles north of Fort Saskatchewan, 4776 and 4777.

E. variegatum Schleich. So far found only on the wet north shore of "The Island" in the river 1 mile northeast of Fort Saskatchewan, 48.

LYCOPODIACEAE

Lycopodium clavatum L. Sandhills 15 miles north of Fort Saskatchewan, 51.

L. complanatum L. In sand under jackpines in the Sandhills, 15 miles north of Fort Saskatchewan, 4957.

L. obscurum L. var. **dendroideum** (Michx.) D. C. Eaton. Plentiful in Sandhills, 15 miles north of Fort Saskatchewan, 50 and 1154.

L. tristachyum Pursh. Winterburn 3 or 4 miles west of Edmonton. Moss 2481. Det. H. M. Raup.

SELAGINELLACEAE

Selaginella densa Rydb. Very dry slopes. Not common. Fort Saskatchewan, 1570.

S. selaginoides (L.) Link. Wet edge of bare clay area, Whitemud Creek, 1402.

PINACEAE

Larix laricina (Du Roi) Koch. Common in swamps among Sandhills. Scotford Sandhills, 2511.

Picea glauca (Moench) Voss. Common along rivers and low places. Fort Saskatchewan, 1156.

P. mariana (Mill.) B.S.P. In Edmonton area, only on muskegs in Sandhills, 1155.

Pinus Banksiana Lamb. Plentiful on Sandhills, 14 miles N. of Fort Saskatchewan, 1152.

P. Murrayana Balf. Sandhills, 7 miles west of Edmonton, Moss 6408.

JUNIPERACEAE

Juniperus horizontalis Moench. Occasional in Sandhills on arid slopes. Sandhills, 15 miles north of Fort Saskatchewan, 54.

J. sibirica Burgsd. *(J. communis* L. var. *sibirica* (Burgsd.) Rydb.). Dr. Moss thinks this probably occurs in the Edmonton area as he has it from Donalda, Alberta, and Castor, Alberta.

TYPHACEAE

Typha latifolia L. Abundant in slough borders. Fort Saskatchewan, No. 55; Lily Lake, 4549.

SPARGANIACEAE

Sparganium eurycarpum Engelm. Common along shores of lakes and rivers, 25 or 30 miles west of Edmonton, 58; Elk Island Lake, 2729.

S. multipedunculatum (Morong) Rydb. Common along shores of streams and lakes, Fort Saskatchewan, 56; Sturgeon River, 57.

NAJADACEAE

Potamogeton filiformis Pers. Pigeon Lake, Moss, 4111. Fort Trail near Edmonton on east, Moss, 6395.

P. Friesii Rupr. Found only in two lakes, tiny Grimsby School Lake about 15 miles northeast of Fort Saskatchewan, 3619 and 3565 and Lily Lake, 4554 and 4702.

P. gramineus L. var. **maximus** Morong ex Benn. Occasional in sloughs in vicinity of Fort Saskatchewan, 3409, 3502, 3579 and 3648 and in Pigeon Lake, 4644, 4649, 4653 and 4671.

P. gramineus L. var. **typicus** Ogden. Occasional in slough in vicinity of Fort Saskatchewan, 3496, 3597, 3613, 3614, 3659, 3660, 4208 and 4249.

P. natans L. At Fawcett a little north of Westlook, Alberta, and about 25 miles or so north of Edmonton, Moss, 2813. Determined by H. M. Raup.

P. panormitanus Biv. Occasional in sloughs, Fort Saskatchewan, 3530 and 3580; Grimsby School Lake (15 miles east), 3566 and 3569.

P. pectinatus L. Common in sloughs and lakes. Fort Saskatchewan, 3552 and 3647 (Davis Lake); Elk Island Lake, 3625 and 3628; Lily Lake, 4556.

P. praelongus Wulfén. Found so far only in Pigeon Lake (4662, 4673 and 4687), and in Lily Lake (4700 and 4704). Plentiful in both lakes. One incomplete plant found washed ashore on Ma-me-O Beach, Pigeon Lake, measured 13 feet in length.

P. pusillus L. var. **typicus** Fern. Fairly common in sloughs and streams. Fort Saskatchewan, 2088; Davis' Lake, 3539; Sturgeon River, 60 and 2274.

P. Richardsonii (Benn.) Rydb. Common in sloughs, lakes and streams. Sturgeon River, 62, 2671 and 3975; Lily Lake, 4557 and 4703.

P. strictifolius Benn. var. **rutiloides** Fern. Only one collection made in a slough 4 miles southeast of Fort Saskatchewan, 3641. Determined by N. C. Fassett.

P. tenuifolius Raf. *(P. alpinus,* var. *tenuifolius).* Fawcett, North of Westlock, Alberta, and 25 miles or so north of Edmonton. Moss, 2812.

P. vaginatus Turcz. Fairly common in lakes and rivers, Sturgeon River, 59; Elk Island Lake, 3629; Pigeon Lake, 4648.

P. zosteriformis Fern. Found so far only in Lily Lake and Pigeon Lake. Lily Lake, 4553, 4706 and 4710; Pigeon Lake, 4672a.

Zannichellia palustris L. Davis Lake in two feet of water, 3539a.

Najas flexilis (Willd.) Rostk. and Schmidt. Apparently very rare in Alberta. The only occurrence of which I have knowledge is in Battle Lake, about 50 miles southwest of Edmonton, 5950.

SCHEUCHZERIACEAE

Triglochin maritimum L. Fairly common on wet edges of streams, bogs, etc. Whitemud Creek, 1416; Sandhills, 14 miles north of Fort Saskatchewan, 63.

T. palustre L. Occasional on wet ground. Whitemud Creek, 1407; shore of North Saskatchewan River, opposite Fort Saskatchewan, left shore, 2841.

Scheuchzeria palustris L. Collected by Professor Moss at Nestow, 55 miles north of Edmonton, 644 and 4411, and seen by him nearer Edmonton. Common locally in a bog east of Ma-Me-O Beach, Pigeon Lake, 5858, 5867, 5880, 5924 and 5932.

ALISMACEAE

Alisma brevipes Greene. Only one small colony of this plant has been found by me on the wet right shore of the North Saskatchewan River about ¼ mile above Fort Saskatchewan, 2244.

A. Geyeri Torr. Shallow water in Sturgeon River, 2269.

Sagittaria cuneata Sheldon. Common in edges of lakes, streams and sloughs. Ross Creek at Fort Saskatchewan, 65 and 2048; Slough, 2097; Elk Island Lake, 66 and 67.

GRAMINEAE

Agropyron albicans Scribn. & Smith. Found as yet only on the C.N.R. grade just east of Fort Saskatchewan, 1966.

A. cristatum (Schreb.) Gaertn. Becoming common on roadsides and waste places. Fort Saskatchewan, 2026 and 4264.

A. dasystachyum (Hook.) Scribn. Occasional on dry soil, 2035 and 2052.

A. Griffithsii Scribn. & Smith. Found in only one place, on C.N.R. grade a few rods east of Fort Saskatchewan, 139.

A. pauciflorum (Schwein.) Hitchc. (*A. tenerum* Vasey; *A. trachycaulum* (Link) Malte var. *typicum* Fern.) Common on native sod. Fort Saskatchewan, 142, 2787, 4288, 4229; Sturgeon River bank, 4693.

A. repens (L.) Beauv. Abundant on all types of soil. One of our most noxious weeds, 143 and 188.

A. repens (L.) Beauv. var. **Leersianum** Beauv. in a less common form, 143a and 1987.

A. Smithii Rydb. Common on open ground. Fort Saskatchewan, 144, 1428 and 3149.

A. subsecundum (Link) Hitchc. (*A. Richardsonii* (Trin.) Schrad.), *A. trachycaulum* (Link) Malte var. *glaucum* (Pease & Moore) Malte in part. Common on native prairie sod. Fort Saskatchewan, 140, 141, 2153, 2787a and 4275.

A. inerme (Scribn. & Smith) Rydb. Only one small colony found. C.N.R. grade near Fort Saskatchewan, 138.

Agrostis palustris Huds. Common on the wet shores of streams. Fort Saskatchewan, 1102, 1106, 3055, 4697, 4717 and 4632.

A. scabra Willd. Common on open dry prairie and on wet ground. Fort Saskatchewan, 90 and 4530; Sturgeon River bank, 4695.

A. stolonifera L. (*A. alba* Am. auth.) Occasional colonies on dry or wet ground. Fort Saskatchewan, 91, 1423, 4627 and 4633.

Alopecurus aequalis Sobol. Common in wet places. Fort Saskatchewan, 82, 2190 and 4532.

Avena fatua L. A very abundant and noxious weed in most grain fields in this whole area. Fort Saskatchewan, 108; C.N.R. track, Edmonton, Moss, 6367.

A. Hookeri Scribn. Occasional on dry prairie. Fort Saskatchewan, 1383 and 4019a.

Beckmannia Syzigachne (Steud.) Fern. Common in sloughs and creeks. Fort Saskatchewan, 104 and 4562.

Bouteloua gracilis (H.B.K.) Lag. Occasional on steep hillsides. Fort Saskatchewan, 94.

Bromus anomalus Rupr. Common around bluffs and on moist prairie. Fort Saskatchewan, 1446 and 2744.

B. carinatus Hook. & Arn. Found in only one place, Groat Ravine bottom, Edmonton, 4239.

B. ciliatus L. Common around bluffs and in woods. Fort Saskatchewan, 24, 70 and 4274.

B. inermis Leyss. Very common along fence lines, roadsides and in waste places, vacant lots, etc. Fort Saskatchewan, 68 and 69.

B. pumpellianus Scribn. Occasional on river banks and in open prairie. Fort Saskatchewan, 2033 and 2054.

B. purgans L. Only one tiny colony found as yet, on the C.N.R. grade a mile east of Fort Saskatchewan, 2695.

Calamagrostis canadensis (Michx.) Nutt. Fairly common, especially on low ground. Fort Saskatchewan, 137, 4516 and 4607; Pigeon Lake, 4640.

C. canadensis (Michx.) Nutt. var. **scabra** (Presl) Hitchc. Bog in Sandhills 15 miles

north of Fort Saskatchewan, 4574. Det. by J. W. Eastham.

C. inexpansa A. Gray. Common in road ditches and other wet places. Fort Saskatchewan, 133, 134, 135 and 136.

C. montanensis Scribn. Common on sandy soil. Fort Saskatchewan, 128, 130, 131, 1336, 3038, 4438, 4480, 4482, 4502, 4527, 4529, 4540 and 4668.

C. neglecta (Ehrh.) Gaertn. Fairly common on wet soil. Fort Saskatchewan, 127, 129, 1871, 1943, 1964, 2003; Pigeon Lake, 4665.

Calamovilfa longifolia (Hook.) Scribn. Occasional in sandy prairie. Fort Saskatchewan, 92 and 4618.

Cinna latifolia (Trev.) Griseb. Not common. Damp, shaded places. Fort Saskatchewan, 87, 88, 89, 4606 and 4698.

Danthonia intermedia Vasey. Occasional on low places on dry prairie. Fort Saskatchewan, 2543; Whitemud Creek, 2568; Pigeon Lake, 4645.

D. spicata (L.) Beauv. Found so far only on Sandhills, 15 miles north of Fort Saskatchewan, 4585.

Deschampsia caespitosa (L.) Beauv. Common in wet soil. Fort Saskatchewan, 118, 119, 3562.

Echinochloa Crus-galli (L.) Beauv. A garden weed on the farm of Mr. Ben. McKenzie, Grassland, northwest of Edmonton, Alberta, 2322a.

Elymus canadensis L. Common on roadsides, etc. Fort Saskatchewan, 76 and 4614.

E. glaucus Buckl. Hay meadows in low places. Pigeon Lake, 5012.

E. innovatus Beal. Common in and around woods. Fort Saskatchewan, 75, 1250a, 2960, 4490, 4626 and 4635; Pigeon Lake, 4643. In addition colonies of a hybrid form of *E. innovatus* occur at intervals for one half mile along the right bank of the North Saskatchewan River beginning nearly 2 miles below Fort Saskatchewan, 2034, 2143, 3057 and 4023.

E. Macounii Vasey. Occasional on prairie. Fort Saskatchewan, 78, 72 and 4016.

Festuca brachyphylla Schultes. Occasional on sandy ground. Fort Saskatchewan, 2943, 29, 2988 and 3126.

F. duriuscula Koch. Fort Saskatchewan, 124, 2938, 2984, 2986 and 3002. Dry sandy prairie.

F. elatior L. Damp ground. Edmonton, 1356 and 3240.

F. saximontana Rydb. Fairly common on open prairie. Fort Saskatchewan, 122, 123, 3023 and 3029.

F. scabrella Torr. Common on open prairie. Fort Saskatchewan, 120, 2950, 3037, 4384, 4899, 5310 and 5311.

Fluminea festucacea (Willd.) Hitchc. Common in edges of sloughs and lakes. Davis Lake, 3074; Elk Island Lake, 1104.

Glyceria borealis (Nash) Batch. Common in wet places and shallow water. Lake de May, 10 miles north of Camrose, 100 and 101; Fort Saskatchewan Creek, 4600; Sturgeon River, 99 and 102.

G. grandis S. Wats. Common in sloughs and edges of lakes, etc. Fort Saskatchewan, 98, 2013 and 4561.

G. striata (Lam.) Hitchc. Common in wet places. Davis Lake, 4596; Sturgeon River, 103 and 103a.

Hierochloë odorata (L.) Wahl. Common on roadsides and in waste places, a troublesome weed in some sandy fields. Fort Saskatchewan, 79 and 3412.

Hordeum jubatum L. Common on roadsides. A weed in hay meadows. Fort Saskatchewan ,73.

H. jubatum L. var. **caespitosum** (Scribn.) Hitchc. Pigeon Lake, 5008.

Koeleria cristata (L). Pers. (*K. gracilis* Pers.) Common on native prairie sod. Fort Saskatchewan, 111, 112 and 113.

Lolium multiflorum Lam. Lawn of Mr. Alex Schneider's farmhouse, 10 miles east of Fort Saskatchewan, 72. Det. H. M. Raup.

Muhlenbergia cuspidata (Torr.) Rydb. Occasional on dry hillsides. Fort Saskatchewan, 84 and 2197; Edmonton, 3244.

M. racemosa (Michx.) B.S.P. Fairly common, generally on low ground. Fort Saskatchewan, 85; Sandhills, 15 miles north, 86.

M. squarrosa (Trin.) Rydb. (*M. Richardsonis* (Trin.) Rydb.) Occasional on native prairie sod. Fort Saskatchewan, 325 and 3664.

Oryzopsis asperifolia Michx. Occasional in poplar woods. Fort Saskatchewan, 125, 126, 3369 and 3372.

O. canadensis (Poir.) Torr. Occasional on native prairie sod. Fort Saskatchewan, 2544, 2547 and 2845.

O. pungens (Torr.) Hitchc. In sand of Sandhills, 15 miles north of Fort Saskatchewan, 1105; 9 miles northeast of Fort Saskatchewan, 4405 and 4433.

Phalaris canariensis L. Found in only one spot near river bank. Fort Saskatchewan, 117. Not established.

P. arundinacea L. Fairly common in creeks and ditches. Fort Saskatchewan Creek, 114 and 115.

Panicum Wilcoxianum Vasey. Found in only one spot, a sandy slope north of North Saskatchewan River Valley about 5 miles below Fort Saskatchewan, 2469, 2512 and 2516. Det. by Jason R. Swallen.

Phleum pratense L. Common on roadsides and waste places, etc. Fort Saskatchewan, 83, 83a and 83b.

Phragmites communis Trin. Noticed so far only in the edge of Elk Island Lake, 272b. Det. by H. M. Raup.

Poa annua L. Fairly common in wet places. Elk Island Lake, 1103; Sturgeon River shore, 1107 and 4370; Scotford Sandhills, bogs, 4368, 4432 and 4437.

P. arida Vasey. Alkaline flat, Davis Lake, Fort Saskatchewan, 4598. Det. E. H. Moss.

P. compressa L. Fairly common on roadsides and waste places. Fort Saskatchewan, 1424, 1978, 2436 and 4232.

P. interior Rydb. Fairly common along banks of North Saskatchewan River at Fort Saskatchewan. Occasional on prairie, 1323, 1432, 2483, 4533, 4566, 4631 and 4735.

P. palustris L. Common in wet places. Fort Saskatchewan, 152, 153, 3017, 3391, 3570.

P. pratensis L. Abundant everywhere. Fort Saskatchewan, 147, 148, 150 and 151.

P. secunda Presl. Only one colony found on a dry hill side, 5 miles north east of Fort Saskatchewan, 2470, 2471, 2514 and 2967.

Puccinellia distans (L.) Parl. Occasional on roadsides and alkaline flats. Edmonton, 1931, 1938 and 2001; Fort Saskatchewan, 4511 and 4588.

P. Nuttalliana Hitchc. Occasional on roadsides. Fort Saskatchewan, on C.N.R. grade, 97.

Schizachne purpurascens (Torr.) Swallen. (*Avena striata* Michx.) Common in bluffs. Fort Saskatchewan, 105 and 4499.

Setaria viridis (L.) Beauv. Occasional as a roadside weed, especially along the C.N.R. grade, and in grain fields. Fort Saskatchewan, 80 and 4713.

Spartina gracilis Trin. Occasional along the river bank and on one occasion in an open place in poplar woods. Fort Saskatchewan, 4611; Edmonton, 2807.

Sphenopholis intermedia Rydb. Common in damp shaded places, such as creek and river shores. Fort Saskatchewan Creek, 110 and 4563; Sturgeon River, 4694.

Sporobolus cryptandrus (Torr.) A. Gray. Occasional in sandy soil. Sandhills, 15 miles north of Fort Saskatchewan, 95, 2759 and 4573; roadside just east of Lily Lake, 4708.

Stipa comata Trin & Rupr. Fairly common on dry prairie around Fort Saskatchewan, 2059 and 2140.

S. spartea Trin. Fairly common at Fort Saskatchewan, 2142.

S. spartea Trin. var. **curtiseta** Hitchc. Fairly common at Fort Saskatchewan, 107.

S. viridula Trin. Common on dry prairie. Fort Saskatchewan, 106, 4485, 4515, 4560 and 4744.

CYPERACEAE

Carex aenea Fernald. Occasional on low ground. Fort Saskatchewan, 1380, 1599 and 1933. Determined by G. F. Ledingham.

C. angustior Mack. On the highway between Edmonton and Edson, Alberta, collected by W. P. Fraser on July 15, 1940. Determined by F. J. Hermann.

C. aquatilis Wahl. Common in low ground. Whitemud Creek, 1415; Calgary, 3680, 3680a and 4169.

C. arcta Boott. Found in one muskeg in Sandhills, 15 miles north of Fort Saskatchewan, 4584a. Determined by A. E. Porsild.

C. atherodes Spreng. Perhaps the commonest *Carex* in the Edmonton area and the principal constituent of native slough hay. Fort Saskatchewan, 180, 2019 and 4187.

C. atrostachya Olney. Occasional around sloughs. Fort Saskatchewan, 2189, 2564, 3602 and 4335.

C. atratiformis Britt. Found by me only at Whitemud Creek, 2570 and a half mile east of Pigeon Lake, 40 miles southwest of Edmonton, 5009.

C. aurea Nutt. Fairly common in wet places, especially muskegs, Fort Saskatchewan, 1385, 1888 and 3393; 6 miles west of Winterburn, which is about 20 miles west of Edmonton, 2692.

C. Backii Boott. Rare. Low poplar woods on bank of Sturgeon River, 6 miles northeast of Fort Saskatchewan, 2994.

C. Bebbii Olney. Common in moist ground. Whitemud Creek, 2567; Fort Saskatchewan, 3123, 3195, 3798, 3902, 4069 and 4210.

C. brunnescens (Pers.) Poir. var. **sphaerostachya** (Tuckerm.) Kükenth. Occasional in bogs. Fort Saskatchewan, 169, 1910 and 3508.

C. canescens L. Occasional in swamps and bogs. Fort Saskatchewan, 167, 168 and 3509.

C. capillaris L. Occasional in wet, shaded places. Whitemud Creek, 1296; Fort Saskatchewan, 4909.

C. chordorrhiza L. Occasional in bogs. Fort Saskatchewan, 154 and 4580; Pigeon Lake, 4658.

C. concinna R. Br. Occasional in low woods. Fort Saskatchewan, 160 and 2904; Whitemud Creek, Edmonton, 1693.

C. Crawfordii Fern. Rather rare, on low ground. Fort Saskatchewan, 3052, determined by G. F. Ledingham; Elk Island Lake, 184, 2725 and 2730. The last was determined by F. J. Hermann.

C. cristatella Britton. Occasional on low ground. Fort Saskatchewan, 1365, 2604, 2621, 2659 and 2147. Nos. 2621 and 2659 were determined by F. J. Hermann.

C. Deweyana Schw. Fairly common in low woods. Fort Saskatchewan, 166, 1312, 1337, 1909, 2968 and 4223.

C. diandra Schrank. Common in bogs. Fort Saskatchewan, 3560, 4559 and 4578.

C. disperma Dewey. Common in wet woods. Fort Saskatchewan, 164, 1863; Whitemud Creek, Edmonton, 1789 and 2569.

C. Douglasii Boott. Not found with certainty in the Fort Saskatchewan area by me. Patricia, Alberta, Moss, 1190 (July 12, 1927). Patricia is 10 or 15 miles north of Edmonton.

Carex eburnea Boott. Occasional on wooded river banks. Fort Saskatchewan, 2900, 2932, 2955, 2997 and 3249.

C. Eleocharis Bailey. Common on dry prairie. Fort Saskatchewan, 161, 1230 and 3302.

C. festivella Mack. At Lake Wabamun, 35 miles or so west of Edmonton, Moss, 506, determined by M. O. Malte.

C. Garberi Fern. var. **bifaria** Fern. Edmonton, Moss, 4232 and 4254.

C. gynocrates Wormsk. Occasional in wet, mossy woods. Fort Saskatchewan, 1788 and 1860; Whitemud Creek, Edmonton, 1691 and 1784; six miles west of Winterburn (about 26 miles west of Edmonton), 2685.

C. Heleonastes L. Fairly plentiful in one bog in Sandhills, 15 miles north of Fort Saskatchewan, 170, 4584 and 4953. Not found elsewhere by me.

C. heliophila Mack. Common on dry prairie. Fort Saskatchewan, 162, 1322, 2917 and 3045.

Carex Hookeriana Dewey. Occasional in low spots on open prairie. Fort Saskatchewan, 2532, 2549 and 2944.

C. inflata Huds. var. **utriculata** (Boott) Druce. (*C. rostrata* Stokes.) Common around sloughs, lakes and along streams. Fort Saskatchewan, 181 and 1363.

C. interior Bailey. Common in bogs. Fort Saskatchewan, 1384, 1785, 2504 and 2521.

C. lasiocarpa Ehrh. var. **lanuginosa** (Michx.) Clausen and Wahl. Common on edges of sloughs and other wet places. Fort Saskatchewan, 157 and 1451.

C. lasiocarpa Ehrh. var. **americana** Fern. Common in bogs and on shores of rivers, lakes, etc. Fort Saskatchewan, 156, 1364 and 2521a: determined by W. P. Fraser and G. F. Ledingham.

C. leptalea Wahl. Fairly common in wet places. Fort Saskatchewan, 1862, 1906 and 2028.

C. limosa L. Occasional in bogs. Sandhills, 15 miles north of Fort Saskatchewan, 155 and 4583; large bog just east of Pigeon Lake, 4642 and 4660.

C. maritima Gunner. Only one small colony found on the left shore of the North Saskatchewan River a few rods above the Highlevel Bridge, Edmonton, 2448. Determined by W. P. Fraser and confirmed by F. J. Hermann.

C. microptera Mack. In low woods where rather uncommon. River flat at Fort Saskatchewan, 1932 and 2030, Sturgeon River flat, 6 miles northeast of Fort Saskatchewan, 2969 and 2969a.

C. obtusata Lilj. Common on dry prairie. Fort Saskatchewan, 1903, 2498, 2905, 290, 2908, 2912, 2931 and 3385.

C. pachystachya Cham. Rare. Pigeon Lake, 4669; determined by G. F. Ledingham.

C. pauciflora Lightf. Falls on Lake Wabamun about 35 miles west of Edmonton. Moss, 3212.

C. paupercula Michx. Uncommon. Sandhill bog, 15 miles north of Fort Saskatchewan, 158; large bog just a few rods east of Ma-Me-O Beach, Pigeon Lake, 4641.

C. Peckii E. C. Howe. Occasional in low woods, Fort Saskatchewan, 1223, 1309 and 1729.

C. praegracilis Boott. Common in dry or moist soil. Fort Saskatchewan, 1348, 2906, 3073, 4204, 4255, 4258 and 4513.

C. prairea Dewey. In bogs and sloughs, Fort Saskatchewan, 174, 1386 (both in Sandhills 15 miles north), 2603 (Scotford Sandhills) and 4189 in slough a few miles south of Fort Saskatchewan. Determined by W. P. Fraser and F. J. Hermann.

C. praticola Rydb. Fairly common on dry or moist soil. Fort Saskatchewan, 171, 172, 2907, 3048 and 4323. Determinations by W. P. Fraser, E. H. Moss and G. F. Ledingham.

C. Pseudo-cyperus L. Abundant on low ground bordering Lake Eden, about 30 miles west of Edmonton, Moss, 6736. Also at Bretona, Moss, 745.

C. retrorsa Schw. Occasional in wet edges of creeks, sloughs and streams. Fort Saskatchewan, 1546, 4281 and 4531.

C. Richardsonii R. Br. Occasional on dry ground, Fort Saskatchewan, 1728.

C. Rossii Boott. Common on shaded river banks, Fort Saskatchewan, 2899, 2898 and 2926.

C. saltuensis Bailey. Occasional in wet woods and bogs. Fort Saskatchewan, 159, 1334 and 1667.

C. Sartwellii Dewey. Fairly common in wet road ditches, and marshy borders of sloughs. Fort Saskatchewan, 1694, 1843, 4072, 4183, 4227 and 4216.

C. scirpiformis Mack. Occasional in wet places. Whitemud Creek, Edmonton, 1687 and 1787.

C. siccata Dewey. Open, sandy ground. Fairly common. Fort Saskatchewan, 3316, 3323 and 4414.

C. Sprengellii Dewey. Occasional in woods and on open ground. Fort Saskatchewan, 1378 and 1949; Edmonton, on steep hillside, 2506, 2447 and 2638.

C. stipata Muhl. Fairly common in wet places. Fort Saskatchewan, 178 and 3510 and 3574; Groat Ravine, Edmonton, 4243.

C. sychnocephala Carey. Common around sloughs and lakes. Fort Saskatchewan, 182, 1605, 2101, 2184, 2745 and 3617.

C. tenera Dewey. Fairly common in low meadows. Fort Saskatchewan, 1933, 2022, 2089, 3006 and 3050. Determined by W. P. Fraser, A. H. Brinkman and G. F. Ledingham.

C. tenuiflora Wahl. Found thus far only in a bog in Sandhills 15 miles north of Fort Saskatchewan, 1907 and 4579.

C. tincta Fern. Edges of sloughs and creeks. Fort Saskatchewan, 3161 and 4211. Determined by G. F. Ledingham. They seem to me close to *C. tenera* Dewey.

C. trisperma Dewey. Found by me so far only in two small bogs in Elk Island Park 20 miles east of Fort Saskatchewan, 5068. Quite plentiful there. Determined by A. E. Porsild.

C. viridula Michx. Whitemud Creek, Edmonton, 1494.

Eleocharis calva Torr. Fort Saskatchewan, 1240, 2659a, 4486 and 4487; Edmonton, 4447.

E. acicularis (L.) R. & S. Common around sloughs. Fort Saskatchewan, 1939, 1532 and 3592.

E. palustris (L.) R. & S. Common in very wet places. Fort Saskatchewan, 195, 194, 193 and 2192.

E. pauciflorus (Lightf.) Link. Whitemud Creek, 1681 and 1786. Not found elsewhere.

E. uniglumis (Link.) Schultes. River bank, Edmonton, Moss, 5097.

Eriophorum angustifolium Roth. Fairly common in bogs, Scotford Sandhills, 1668; Sandhills 15 miles north of Fort Saskatchewan, 185, 186 and 1262.

E. Chamissonis C. A. Meyer. In bogs in Sandhills, 15 miles north of Fort Saskatchewan, 1259, 4400 and 4412.

E. gracile Koch. Bog in Sandhills, 15 miles north of Fort Saskatchewan, 189. Rare here. Fairly plentiful on the large bog opposite Ma-Me-O Beach on Pigeon Lake, 40 miles S. W. of Edmonton, 4911, 5043 and 5060.

E. spissum Fern. In bogs. Sandhills, 15 miles north of Fort Saskatchewan, 187, 1261 and 4389.

E. viridicarinatum (Engelm.) Fernald. Scotford Sandhills, 2503 and 2539; six miles north west of Winterburn (about 26 miles west of Edmonton ... 2688.

Scirpus americanus Pers. Wetaskiwin, 37 or 38 miles S. of Edmonton, 4638.

S. caespotisus L. var. callosus (Bigelow) Fernald. Six miles north west of Winterburn in a bog, 2687. This is about 26 miles west of Edmonton. Not seen elsewhere by me.

S. pallidus (Britton) Fern. On wet right shore of North Saskatchewan River just above Fort Saskatchewan, 2840. Determined by F. J. Hermann.

S. paludosus A. Nels. Growing in three inches of water in the edge of Lake de May, 42 miles southeast of Edmonton, 191. Determined by W. P. Fraser.

S. rubrotinctus Fern. (*S. microcarpus* Presl). Fairly common in swamps and on wet shores. Fort Saskatchewan, 193 and 3573.

S. validus Vahl. Fort Saskatchewan, 1921 and 2085. Common in sloughs and on river and lake shores.

ARACEAE

Acorus Calamus L. Found only on the marshy eastern shore of Lily Lake about 23 miles northwest of Fort Saskatchewan, 1540 and 4558.

Calla palustris L. Found thus far only on the eastern and western marshy shores of Lily Lake, 1556 and 4551; Lake Eden, 35 miles west of Edmonton, Moss, No. not given.

LEMNACEAE

Lemna minor L. Probably common. Fort Saskatchewan, 197.

L. trisculca L. Probably common. Ross Creek. Fort Saskatchewan, 198.

Spirodela polyrhiza (L.) Schleiden. Sturgeon River at St. Albert, about 5 miles northwest of Edmonton, Moss, 1331.

JUNCACEAE

Juncus ater Rydb. Very common in wet areas. Fort Saskatchewan, 204 and 1357.

J. bufonis L. Common on shores of sloughs, lakes and streams. Fort Saskatchewan, 203 and 4734.

J. Dudleyi Wieg. Common in wet places. Fort Saskatchewan, 199 and 1565.

J. longistylis Torr. Occasional on edges of streams and sloughs. Fort Saskatchewan, 2669 and 4224; Edmonton (on the river shore), 2448; Whitemud Creek, Edmonton, 1405 and 1492.

J. macer S. F. Gray. Rather rare. Fort Saskatchewan, 2623 (det. by W. P. Fraser) and 4215 (det. by E. H. Moss).

J. nodosus L. Common on edges of streams and sloughs. Fort Saskatchewan, 200, 201 and 1566.

J. Richardsonianus Schult. Common on shores of lakes and streams. Fort Saskatchewan, 1108 and 1567.

J. Tracyi Rydb. Shore of river at Fort Saskatchewan, 2835, 2838 and 2839. Det. by F. J. Hermann.

J. Vaseyi Engelm. Occasional around sloughs and bogs. Fort Saskatchewan, 2746, 4191 and 4270.

Luzula multiflora (Ehrh.) Lej. Bogs and wet river flats. Sturgeon River flat, 6 miles northeast of Fort Saskatchewan, 2970; bog in Scotford Sandhills, 2536.

LILIACEAE

Allium cernuum Roth. Common in poplar woods. Fort Saskatchewan, 209 and 210.

A. Schoenoprasum L. var. **sibiricum** (L.) Hartm. Uncommon. In wet ground, Whitemud Creek, Edmonton, 1308.

A. textile Nels. & MacBr. Gravel of C.N.R. grade a few rods east of Fort Saskatchewan, 1768. This gravel was brought from Kinsella, further east in Alberta, four years previously and the *Allium textile* presumably was brought with it as it does not occur here naturally; Island Lake, near Clyde 50 miles or so north of Edmonton, Moss, No. not given.

Disporum trachycarpum S. Wats. Common in low woods. Fort Saskatchewan, 206 and 207.

Lilium umbellatum Pursh. (*L. philadelphicum* L. var. *andinum* (Nutt.) Ker.) Common in open woods and on prairie. Fort Saskatchewan, 208 and 1370.

Maianthemum canadense Desf. var. **interius** Fern. Common in and around woods. Fort Saskatchewan, 219 and 1326.

Smilacina stellata (L.) Desf. Common in and around woods. Fort Saskatchewan, 217 and 4378.

S. trifolia L. Fairly common in the Edmonton area. In swampy ground in the Sandhills, 14 miles north of Fort Saskatchewan, 218 and 218a; Edmonton Beach, Moss, 312, Wetaskiwin, Moss, 1767.

S. racemosa (L.) Desf. In aspen woods on high clay ground, about one mile east of Mulhurst, Pigeon Lake, associated with *Streptopus amplexifolius* (L.) DC., 5034, 15 miles west and 24 miles south of Edmonton. E. H. Moss reports this from Evansburg 55 miles west of Edmonton.

Streptopus amplexifolius (L.) DC., var. **americanus** Schultes. One fairly large colony of this variety was found on high clay ground just south of the eastern end of Battle Lake, about 20 miles south of the place where var. *denticulatus* was found, 5944.

S. amplexifolius (L.) DC., var. **denticulatus Fassett.** Found sparingly in the poplar-birch-woods on high clay ground a mile or so east of Mulhurst, at the northern end of Pigeon Lake, 5035 and 5841.

Both these varieties are apparently members of the relic flora of an earlier more alpine condition there. It is interesting to notice that var. *americanus* represents the form of this plant usually now found on the eastern slopes of the Rocky Mts., while var. *denticulatus* represents the form usually now found on the Pacific side of these mountains.

Tofieldia glutinosa (Michx.) Pers. ssp. **typica** Hitchc. Whitemud Creek, Edmonton, 1301.

Zygadenus elegans Pursh. Common in low meadows. Fort Saskatchewan, 221 and 222.

IRIDACEAE

Sisyrinchium angustifolium Miller. Common on open ground. Fort Saskatchewan, 223 and 224.

S. mucronatum Michx. Only one small colony found, on "The Island" about a mile northeast of Fort Saskatchewan, 1924. Determined by W. P. Fraser.

ORCHIDACEAE

Calypso bulbosa (L.) Oakes. Wolf Creek (96 miles northwest of Edmonton) on slope in moist woods, 231.

Corallorrhiza trifida Chatelaine. Uncommon, but fairly wide-spread in small colonies in wet places. Fort Saskatchewan, 2501, 2580, 3368 and 4045; Whitemud Creek, Edmonton, 1853; Elk Island Park, 228.

Cypripedium Calceolus L. var. **parviflorum** (Salisb.) Fern. Common in and around bluffs. Fort Saskatchewan, 232 and 4077.

C. parviflorum Salisb. var. **pubescens** (Willd.) Knight. Occasional in woods. Fort Saskatchewan, 233 and 4057.

C. passerinum Richards. Wet slope at Whitemud Creek, Edmonton, 1306 and 1708.

Habenaria bracteata (Willd.) R. Br. Common in woods and low places. Fort Saskatchewan, 227, 1890 and 1999a.

H. dilatata (Pursh) Hook. Lily Lake, about 30 miles north of Edmonton. Moss, 675.

H. hyperborea R. Br. Bog in Sandhills 15 miles north of Fort Saskatchewan, 1429; Whitemud Creek, Edmonton, 1430.

H. obtusata (Pursh) Richards. Damp woods 2 miles northeast of Fort Saskatchewan, 229; Whitemud Creek, Edmonton, 1852.

Listera borealis Morong. Wetaskiwin, 35 miles S. of Edmonton, Moss, 1741; moist woods, Fort Saskatchewan, 230.

Malaxis unifolia Michx. Rare and always very scarce in damp spruce woods a little south of Davis Lake, Fort Saskatchewan, 2166; bog at Whitemud Creek, Edmonton, 1422; Atim Creek, 6 miles west of Winterburn (26 miles west of Edmonton), 2681a.

Orchis rotundifolia Pursh. Fairly common in wet places in woods, bogs, etc. Fort Saskatchewan, 234, 235, 4079 and 4468; Whitemud Creek, Edmonton, 1307.

Spiranthes stricta Rydb. (*S. Romanzoffiana* Cham. and Schlecht.) Sandhills bog, 15 miles north of Fort Saskatchewan, 225; bog at Whitemud Creek, Edmonton, 1504; bog just east of Pigeon Lake, 4646.

SALICACEAE

Populus tacamahaca Miller. Common along streams and other moist places. Fort Saskatchewan, 266b and 1707.

P. tacamahaca Miller var. **Michauxii** (Dode) Farwell. Nearly as common around Fort Saskatchewan as the species, 266a and 1706. Determined by H. M. Raup.

P. tremuloides Michx. On high or low ground. The commonest tree by far of the Edmonton District. Fort Saskatchewan, 263 and 1591.

P. virginia Fourg. (*P. deltoides* Marsh.). Fort Saskatchewan, 264a; Edmonton, 264 (introduced).

Salix arbusculoides Anders. Occasional along the shore of the North Saskatchewan River near Fort Saskatchewan, 1183, 1215, 1248, 1658, 1658a and 2134; Edmonton, Moss, 2133.

S. Bebbiana Sarg. Common even on dry upland. Fort Saskatchewan, 2155, 2576 and 2846.

S. Bebbiana Sarg. var. **perrostrata** (Rydb.) Ball. Also common. Fort Saskatchewan, 243 and 244.

S. candida Flügge. Fairly common in wet places. Fort Saskatchewan, 241, 1233, 1264, 1300 and 1711.

S. discolor Muhl. Common on low ground, Fort Saskatchewan, 246, 247, 248, 249, 1200, 1285, 1179, 1646, 2857, 2857a and 2929.

S. fallax Raup. Several fairly large colonies found at Whitemud Creek on the western edge of Edmonton were determined by Dr. Hugh M. Raup as above, 1299, 1411, 1683, 1782 and 2429.

S. gracilis Anders. (*S. petiolaris* Am. auth., not J. E. Smith. See Rhod. 48: 46-8 (1946)). Very common on wet ground. Fort Saskatchewan, 259, 1180, 1202, 1287, 2502, and 2538.

S. interior Rowlee. Common on low ground especially on river bars, ditches, creeks, etc. Fort Saskatchewan, 3974.

S. interior Rowlee var. **pedicellata** (Anders.) Ball. Common on low ground. Fort Saskatchewan, 260, 261, 1195 and 1271.

S. interior Rowlee var. **Wheeleri** (Rowlee) Schn. Edmonton, 2455.

S. lasiandra Bentham. Fairly common along river banks. Fort Saskatchewan, 254 and 256 Det. C.R. Ball.

S. lasiandra Bentham var. **lancifolia** (Anders.) Ball. Fairly common along river banks and lake shores. Fort Saskatchewan, 257, 1318, 1662, 1719, 1719a and 1733. Determined by Dr. Carleton R. Ball.

S. lutea Nutt. Common in low places, Fort Saskatchewan, 252, 1171, 1220, 1286, 2885 and 2886.

S. MacCalliana Rowlee. Fairly common on low, peaty meadows. Fort Saskatchewan, 236, 237, 1227, 1249 and 1755.

S. Mackenziana (Hook.) Barr. Edmonton, Moss, 2135. Determined by Dr. Carleton R. Ball.

S. myrtillifolia Anders. Occasional on low ground, Fort Saskatchewan, 238, 1183, 1173a, 1178, 1228, 1238, 1316, 1752, 1752a and 1753.

S. pedicellaris Pursh var. **hypoglauca** Fern. Fairly common in bogs, Sandhills 15 miles north of Fort Saskatchewan, 251 and 1263.

S. planifolia Pursh. Fairly common on low, peaty soil. Fort Saskatchewan, 245, 1172, 1174 and 1292.

S. planifolia Pursh var. **Nelsoni** Ball. Swampy flat of Sturgeon River, 1331; Sandhill bog, 15

miles north of Fort Saskatchewan, 242, 1150 and 1236. All determined by C. R. Ball.

S. pseudomonticola Ball. Common on low ground. Fort Saskatchewan, 239, 240, 1157, 1157a, 1167, 1197, 1201 and 1289.

S. pyrifolia Anders. (*S. balsamifera* (Hook.) Barratt) Bog in Sandhills, 15 miles north of Fort Saskatchewan, 250, 1237 and 1266. Also found in the Scotford Sandhills on low ground 9 miles N.E. of Fort Saskatchewan, and at edge of bog opposite Ma-Me-O Beach, Pigeon Lake, 4929.

S. Scouleriana Barratt. Another member of the relic flora at Pigeon Lake, found plentifully on high ground in poplar and birch woods a mile east of Mulhurst, and occasionally on similar high ground near Ma-Me-O Beach. This is its only occurrence in the Edmonton district of which I have knowledge, 5498, 5838, 5845, 5846 and 5887.

S. serissima (Bailey) Fern. Sandhills, 15 miles north of Fort Saskatchewan, plentiful on one bog, 258; shore of Lily Lake, 1537. Two other small colonies have been seen by me in the vicinity of Fort Saskatchewan, but no collections made.

BETULACEAE

Alnus crispa (Ait.) Pursh. Rare in Fort Saskatchewan area. Sandhills, 15 miles north of Fort Saskatchewan 269, 270 and 1274, but plentiful on east side of Pigeon Lake, 40 miles S. W. of Edmonton.

A. tenuifolia Nutt. Common along streams and lakes. Fort Saskatchewan, 267, 268, 1146, 4773, 4783, 4855 and 4968.

Betula occidentalis Hook. (*B. fontinalis* Sarg., *B. microphylla* Bunge). Occasional in muskeg and on banks of streams. Sandhills, 14 miles north of Fort Saskatchewan, 273 and 274; Fort Saskatchewan, 2850, 2861, 2868, 2888, 2889 and 2928.

B. glandulosa Michx. Fairly common on low ground. Fort Saskatchewan, 271; Sandhills, 15 miles north of Fort Saskatchewan, 272.

B. papyrifera Marsh. Common along streams and other wet places. Fort Saskatchewan, 275, 2378, 2518 and 2844.

B. papyrifera Marsh. var. **neoalaskana** (Sarg.) Raup. In Rhodora of October 1945, Professor Fernald revises this as *B. papyrifera* Marsh. var. *humilis* (Regel.) Fern. and Raup. Occasional in low places. Fort Saskatchewan, 2359 and 2485; Sandhills, 8 miles northeast of Fort Saskatchewan (Scotford), 1911.

Corylus rostrata Ait. Common on wooded slopes, etc. Fort Saskatchewan, 276.

CANNABINACEAE

Humulus Lupulus L. (*H. americana* (Nutt.) L. H. Bailey). Growing as an escape in river valley near Fort Saskatchewan, Moss, 6569.

URTICACEAE

Urtica gracilis Ait. Common, especially in moist woods. Fort Saskatchewan, 282, 2032 and 2169.

U. urens L. A troublesome and persistent weed in a few farm gardens near Fort Saskatchewan, 283, 284, 285 and 2256.

POLYGONACEAE

Bilderdykia Convolvulus (L.) Dum. (*Polygonum Convolvulus* L.) A common weed in fields and on roadsides. Fort Saskatchewan, 288.

Fagopyrum tataricum (L.) Gaertn. Becoming fairly common as a weed in grain fields around Fort Saskatchewan, 1444, 3631 and 4709. It is considered noxious because it cannot be separated from wheat, and it lowers the grade of the wheat since it darkens the flour.

Polygonum achoreum Blake. Common on hard edges of roads and similar situations. Fort Saskatchewan, 1770, 2094, 2278, 4302, 4306, 4599, 4727 and 4731.

P. aviculare L. Common also on hard, travelled ground. Fort Saskatchewan, 55, 1769, 2093, 2280 and 4269.

P. buxiforme Small. Fairly common on roadsides, etc. Fort Saskatchewan, 2154, 2181, 2309, 4234, 4252 and 4278.

P. coccineum Muhl. Fairly common in ponds, Fort Saskatchewan, 293, 2014, 2107, 2178, 2194, 2195 and 2255. Stanford, (forma *natans* (Wieg.) Stanford).

Common on hard, dry ground adjacent to pools or creeks. Fort Saskatchewan, 16, 293, 1992, 2015, 2233, 2764, 2768 and 2891. (forma *terrestre* (Willd.) Stanford).

P. coccineum Muhl. var. **pratincola** (Greene) Stanford. Occasional in ponds. Fort Saskatchewan, 2108, 2324, 2666 and 2765.

P. coccineum Muhl. var. **rigidulum** (Sheldon) Stanford. Occasional in ponds. Fort Saskatchewan, 2325 (determined by J. H. Soper) and 2194 (determined by H. M. Raup).

P. exsertum Small. Common in edges of sloughs. Fort Saskatchewan, 2040, 2182, 3411, 3537, 3623, 2637, 3586, 3649, 4226 and 4235.

P. lapathifolium L. Common around sloughs. Fort Saskatchewan, 67, 286, 1447, 1500, 2566, 2616, 2694, 2708, 2801 and 3630.

P. lapathifolium L. var. **salicifolium** Sibth. Occasional around sloughs and on shores. Fort Saskatchewan, 1970, 2616, 2658, 2707 and 3630.

P. natans A. Eaton. Common in ponds. Fort Saskatchewan, 46, 294, 295, 1919, 2021, 2106 and 2109. *(f. genuinum* Stanford). Occasional in low land adjacent to sloughs but not in water. Fort Saskatchewan, 296, 1969, 2041, 2073, 2075 and 2174. (f. *Hartwrightii* (Gray) Stanford).

P. neglectum Besser. Fairly common in low places, such as the borders of sloughs. Fort Saskatchewan, 2112, 2116, 2199, 2775, 4250 and 4338; Edmonton, 2775.

P. rubescens Small. Common in wet land around sloughs and on dry roadsides and waste areas. Fort Saskatchewan, 1771, 1915, 1958, 2037, 2148, 2180, 2246, 2248, 2277, 2313, 2634, 2637, 2843, 3405, 3406, 3453, 3586, 3615, 3649, 4026, 4260 and 4451.

P. scabrum Moench. Occasional on wet edges of sloughs, river shores, etc. Fort Saskatchewan, 2187, determined by H. M. Raup and 3630, determined by Jas. H. Soper.

I am indebted to Jas. H. Soper for checking all my *Polygonum* species while this list was being prepared.

Rumex Acetosa L. Roadside by farm of Alex Schneider, 10 miles east of Fort Saskatchewan. Escaped from garden, 315 and 316, determined by W. P. Fraser.

R. Acetosella L. C.N.R. grade. Fort Saskatchewan, and a troublesome wood in one grain field, Fort Saskatchewan, 313 and 314.

R. fueginus Philippi. Fairly common on wet edges of sloughs and lakes. Fort Saskatchewan, 1873, 1971 and 2183; a lake 30 miles west of Edmonton, 312, determined by H. M. Raup.

R. triangulivalvis (Danser) Rech. f. Common on low ground. Fort Saskatchewan, 311; Lake de May, 310.

R. occidentalis Wats. Occasional on low ground genarlly at edge of willow bluff. Fort Saskatchewan, 317 and 2156; determined by H. M. Raup.

CHENOPODIACEAE

Atriplex hortense L. Waste ground, Edmonton, 4995, 5064 and 5259.

A. hortense L. var. **atrosanguineum** Hort. A weed in some gardens and occasional as a roadside garden escape. Fort Saskatchewan, 333. Plentiful on waste ground in river valley in Edmonton, 5065 and 5258.

A patula L. A fairly common weed in low, saline areas. Fort Saskatchewan, 1527, 2803, and 4332.

A patula L. var. **subspicatum** (Nutt.) Greene. Fort Saskatchewan, 1796, 1527, 2245, 2285 and 4724; Edmonton, 2310, the last determined by H. M. Raup.

Axyris amaranthoides L. An abundant, but not very noxious weed in gardens and roadsides, etc. Fort Saskatchewan, 324 and 4315.

Chenopodium album L. A very common weed of gardens, roadsides and fields. Fort Saskatchewan, 330 and 4691.

C. capitatum (L.) Arch. Fairly common around woods. Occasional as garden weed. Fort Saskatchewan, 329 and 4461.

C. hybridum L. Fairly common in woods. Occasional as roadside weed. Fort Saskatchewan, 325 and 4282.

C. leptophyllum Nutt. Sandhills 15 miles north of Fort Saskatchewan, 4572. Quite plentiful on sand dunes there. Not found elsewhere as yet by me.

C. rubrum L. Fairly common weed around sloughs. Occasional in gardens. Fort Saskatchewan, 331, 332, 1795, 2092 and 4720, determined by H. M. Raup.

C. salinum Standl. Common on low, saline areas, even in gardens (near ash piles, etc.), Fort Saskatchewan, 327 and 328.

Coriospermum marginale Rydb. Along the C.N.R. grade and in one grain field. Fort Saskatchewan, 1574 and 4319.

Monolepis Nuttalliana (Schult.) Greene. A common weed in gardens, on roadsides, etc. Fort Saskatchewan, 322.

Salsola pestifer A. Nels. *(S. Kali* L.) Common on roadsides and waste places. Fort Saskatchewan, 319 and 4602.

Suaeda depressa (Pursh) S. Wats. On low, alkaline ground. Fort Saskatchewan, 4203, 4304, 4331 and 4279. The only place where found so far by me is on shore of Davis Lake, 4 miles southeast of Fort Saskatchewan; plentiful there.

S. erecta (S. Wats.) A. Nels. Shore of Lake de May, 323.

AMARANTHACEAE

Amaranthus blitoides S. Wats. Rare in the Edmonton area. Road edge 10 miles east of Fort Saskatchewan, 3215.

A. graecizans L. Common weed of gardens and waste places. Fort Saskatchewan, 338, 339, 4312, 4320 and 4604.

A. retroflexus L. Common weed in gardens, fields and roadsides. Fort Saskatchewan, 335, 336, 4326 and 4329.

CARYOPHYLLACEAE

Arenaria lateriflora L. Common in poplar woods. Fort Saskatchewan, 361, 1767 and 1792. Determined by Dr. H. M. Raup.

A. lithophila Rydb. Disturbed area near a gravel pit. Edmonton. Moss, 7097.

Cerastium campestre Greene. Common on prairie and in low places. Fort Saskatchewan, 360, 4409, 4434, 4435, 4462 and 4474.

C. nutans Raf. Fairly common in wet places in woods. Fort Saskatchewan, 353, 359, 2877 and 4440.

C. vulgatum L. var. **hirsutum** Fries. Fairly widespread in boggy and other wet places, Fort Saskatchewan, 4395, 4423 and 4473; Pigeon Lake, 4670 and 4676, determined by A. E. Porsild.

Gypsophila elegans Bieb. Occasionally as garden escape on roadsides. Fort Saskatchewan, 356 and 4524, determined by Herbert Groh.

G. paniculata L. Becoming in recent years quite common as a weed on roadsides and vacant lots and C.N.R. grade far from any garden. Fort Saskatchewan, 2045.

Melandrium Drummondii (Hook.) Porsild. (*Wahlbergia Drummondii* (Hook.) Rydb.) Occasional on dry ground near woods. Fort Saskatchewan, 352 and 1330.

Lychnis alba Mill. (*Melandrium album* (Mill.) Garcke) Grain field 8 miles northeast of Fort Saskatchewan, 3024; Roadside 10 miles east of Fort Saskatchewan, 3155.

Saponaria officinalis L. Occasional on roadsides as garden escape. Fort Saskatchewan, 2769 and 4184.

S. **Vaccaria** L. Occasional as a weed on C.N.R. grade and on roadsides. Fort Saskatchewan, 353 and 3547.

Silene Menziesii Hook. Weed in grain field adjacent to Fort Saskatchewan, 4330, determined by Herbert Groh.

S. noctiflora L. C.N.R. grade, Fort Saskatchewan, 1098, determined by H. A. Senn.

S. vulgaris (Moench) Garcke. (*S. latifolia* (Mill.) B. & R.) Road ditch about 10 miles west of Fort Saskatchewan, 351.

Spergula arvensis L. Grain field near Lake de May, 357; roadside just east of Lily Lake, 4545. I also once saw it on a roadside in Patricia district about 8 miles northwest of Fort Saskatchewan.

Stellaria calycantha (Ledeb.) Bong. Fairly common in moist woods. Fort Saskatchewan, 346, 347, and 4590.

S. crassifolia Ehrh. Fairly common in wet, boggy places. Fort Saskatchewan, 349, 350, 2159, 2499, 4548 and 4593.

S. longifolia Muhl. Common in wet places. Fort Saskatchewan, 344, 2334 and 4436.

S. longipes Goldie. Common in wet places. Fort Saskatchewan, 1776, 1841 and 1848, determined by H. M. Raup.

S. media (L.) Cyrill. A troublesome weed in gardens and other cultivated ground. Fort Saskatchewan, 348, 1963, 3068 and 4452.

S. sitchana Steud. Quite plentiful over perhaps 100 acres or more of the large bog just east of Ma-Me-O Beach on Pigeon Lake, and seemingly another relic of an earlier more alpine flora of this area. Determined by A. E. Porsild, 5869 and 5881.

PORTULACACEAE

Portulaca oleracea L. A very troublesome weed in some gardens. Fort Saskatchewan, 364.

CERATOPHYLLACEAE

Ceratophyllum demersum L. Plentiful in Lily Lake, 4707. I have not found it elsewhere.

NYMPHAEACEAE

Nuphar variegatum Engelm. (*N. americana* Mill. and Standl.) Occasional in lakes. Lily Lake, 1535 and 4546; small lake about 40 miles west of Edmonton, 365.

RANUNCULACEAE

Actaea alba (L.) Mill. Common in woods. Fort Saskatchewan, 371.

A. rubra (Ait.) Willd. Common in woods. Fort Saskatchewan, 372.

Anemone canadensis L. Common in prairies and woods. Fort Saskatchewan, 408 and 409.

A. cylindrica A. Gray. Common in prairies. Fort Saskatchewan, 413.

A. globosa Nutt. (*A. multifida* Poir. var. *hudsoniana* DC.) Common on open ground. Fort Saskatchewan, 411, 412, 1867, 2587 and 2588.

A. patens L. var. **Nuttalliana** A. Gray (*Pulsatilla ludoviciana* (Nutt.) Heller) Very common on open ground. Fort Saskatchewan, 405, 406.

Aquilegia brevistyla Hook. Common in woods, especially along the river banks. Fort Saskatchewan, 420, 421 and 421a.

Caltha natans Pall. Wet edge of a tiny creek, Seba Beach 60 miles west of Edmonton, 414, 415; wet shore of Lily Lake, 1533; wet shore of North Saskatchewan River at Fort Saskatchewan, 2137 and 2232.

C. palustris L. Common in wet places. Sandhills Bog, 15 miles north of Fort Saskatchewan, 416, 417 and 418; Scotford Sandhills, 4363.

Clematis orientalis L. Edge of railway embankment, above Golfcourse, Edmonton, 2644, far from any dwelling.

C. columbiana A. Gray. Wooded river bank, Edmonton, 367, 1210 and 1305.

Delphinium Ajacis L. Road ditch far from any dwelling, Partridge Hill, 7 miles southeast of Fort Saskatchewan, 2098, determined by W. P. Fraser.

D. glaucum Wats. (*D. scopulorum* Gray var. *glaucum* Gray; *D. Brownii* R. H.) A large colony was found at the edge of a hay meadow adjacent to the large bog opposite Ma-Me-O Beach, Pigeon Lake, 15 miles west and 25 miles south of Edmonton, 5006 and 5013, 5830, 5885 and 5886.

Ranunculus abortivus L. Occasional in wet woods, Fort Saskatchewan, 383, 384, 385 and 386.

R. acris L. Fairly common on roadsides and vacant lots. Fort Saskatchewan, 382.

R. apetalus Farr. Rare. In shade of aspens, Fort Saskatchewan, 390, 391, 392 and 393.

R. cardiophyllus Hook. Occasional on open prairie. Fort Saskatchewan, 395 and 1231.

R. Cymbalaria Pursh. Common on slough borders and shores of streams. Fort Saskatchewan, 396 and 398.

R. lapponicus L. Wooded swamp in Sandhills, 15 miles north of Fort Saskatchewan, 4398; mossy mound under trees at Atim Creek, 19 miles west of Edmonton, 2681.

R. Macounii Britton. Common on wet ground. Fort Saskatchewan, 377, 378 and 379.

R. pennsylvanicus L. Fairly common on wet ground, Fort Saskatchewan, 2611, 2624 and 2668.

R. Purshii Richards. (*R. Gmelini* DC. var. *Purshii* (Richards.) Hara). Common in very wet soil or shallow water. Fort Saskatchewan, 387, 389 and 2317; Edmonton, McCalla, 2612.

R. rhomboideus Goldie. Common on dry prairie. Fort Saskatchewan, 399 and 2876.

R. sceleratus L. Common around sloughs. Fort Saskatchewan, 394 and 3643.

R. trichophyllus Chaix. var. **typicus** Drew. (*Batrachium trichophyllum* (Chaix.) Bosch.) Common in sloughs, small streams, etc. Fort Saskatchewan, 400, 403 and 2490.

Thalictrum dasycarpum Fisch. & Lall. Fairly common in edge of woods. Fort Saskatchewan, 370 and 3554.

T. sparsiflorum Turcz. var. **Richardsonii** (Gray) Boivin. Seba Beach. Moss, 6780; Turner, 5650-1 and 5653.

T. Turneri Boivin (**T. dioicum** Am. auctt. non L.) Poplar bluffs. Fort Saskatchewan, 4875, 4884, 4891, 4945, 4974, 4988.

T. venulosum Trel. Common in woods. Fort Saskatchewan, 335, 369, 3361 and 3482.

FUMARIACEAE

Corydalis aurea Willd. Common around woods and open ground. A persistent and troublesome weed in many grain fields. Fort Saskatchewan, 422, 4838, 4876 and 4849.

C. sempervirens (L.) Pers. Rare in the district. Sandhills, 15 miles north of Fort Saskatchewan, 423, 424, 425 and 4965.

BRASSICACEAE

Arabis divaricarpa A. Nels. (*A. brachycarpa* (T. & G.) Britton) Occasional in sandy places. Fort Saskatchewan, 462, 467 and 2723a.

A. glabra (L.) Bernh. var. **typica** Hopkins (*Turritis glabra* (L.) Gray) Occasional in poplar woods. Fort Saskatchewan, 459, 1968 and 2723.

A. hirsuta (L.) Scop. var. **pycnocarpa** Hopkins) Rollins. Common in woods and open places. Fort Saskatchewan, 460.

A. lyrata L. var. **kamtchatica** Fischer. Only in sand of Sandhills, 15 miles north of Fort Saskatchewan, 457, 458 and 4955. Plentiful there.

Barbarea vulgaris R. Br. One fairly extensive roadside colony on the highway about half way between Fort Saskatchewan and Edmonton, 1250 and 1376.

Brassica arvensis (L.) Ktze. A common and very noxious weed in grain fields. Fort Saskatchewan, 441 and 442.

Camelina microcarpa Andrz. In wheat field 9 miles east of Fort Saskatchewan, 439 and 439a.

C. sativa (L.) Crantz. C.N.R. grade, Fort Saskatchewan, 438.

Capsella Bursa-pastoris Medic. Common in gardens, on roadsides and in grain fields. Fort Saskatchewan, 434 and 435.

Cardamine pensylvanica Muhl. Common in shaded, wet places, Fort Saskatchewan, 446.

Cardaria Draba L. var. **repens** (Schrank) O. E. Schulz. (*Lepidium Draba* (L.) Desv. Alfalfa field adjacent to Fort Saskatchewan, 3404, 3454, 3498, 3499, 3551, 4901 and 4971.

Conringia orientalis (L.) Dumartier. C.P.R.

grade, Edmonton, 4444; C.N.R. grade near Fort Saskatchewan, 443 and 1291; C.N.R. grade at Pilon Creek, 3 miles west of Fort Saskatchewan, 2952.

Descurainia pinnata ssp. **brachycarpa** (Richards) Detling. (*Sophia intermedia* Rydb.) Fairly common on roadsides etc. Fort Saskatchewan, 1976, 2524 and 4456, determined by LeRoy E. Detling.

D. Richardsonii ssp. **typica** Detling. (*Sisymbrium incisum* Engelm. var. *Hartwegianum* (Fourn.) Wats.) Common on roadsides and in woods. Fort Saskatchewan, 431, 2596, 2700, 2739 and 2770.

D. Sophia (L.) Webb. An abundant weed along fence lines, in gardens and waste places. Fort Saskatchewan, 428, 4351 and 4481.

Diplotaxis muralis DC. Waste ground, Edmonton, Moss, 7245.

Draba nemorosa L. var. **leiocarpa** Lindb. (*Draba lutea* Gilib.) Common in woods and on open ground. Fort Saskatchewan, 436a, 436b, 437 and 2500.

Erucastrum gallicum (Willd.) O. E. Schulz. Occasional along the C.N.R. grade. Fort Saskatchewan, 456, 3046 and 3141.

Erysimum asperum DC. (*Cheirinia aspera* (Nutt.) Rydb.) Fairly common in woods and open ground. Fort Saskatchewan, 454, 2542 and 3459.

E. cheiranthoides L. Common in woods. Fort Saskatchewan, 452 and 453.

Hesperis matronalis L. Weed in a vegetable garden near Lake de May, 447.

Lepidium densiflorum Schrad. (*L. apetalum* A. Gray) A very common weed in gardens, fields and waste places. Fort Saskatchewan, 440, 1872 and 4047.

L. ramosissimum A. Nels. A common roadside and garden weed in and around Fort Saskatchewan, 1926, 4048, 4868, 4880, 4948 and 4991.

Neslia paniculata Desv. A common and troublesome weed in fields. Fort Saskatchewan, 455.

Rorippa austriaca (Crantz.) Besser. Dry roadside 4 miles south of Fort Saskatchewan, 1954, and 1986, determined by Herbert Groh.

R. islandica (Oeder) Borbas. var. **microcarpa** (Regel.) Fern. Common in wet places. Fort Saskatchewan, 450, 1754, 1864, 1896, 2201 and 2259. H. M. Raup, det.

Sisymbrium altissimum L. (*Norta altissima* (L.) Britton) A common roadside weed. Fort Saskatchewan, 427 and 4721.

S. linifolium Nutt. Dry pasture 4 miles south of Fort Saskatchewan, 426, collected for me by Frank Hennig, determined by Herbert Groh.

S. Loisellii L. Weed in wheat field 9 miles east of Fort Saskatchewan, 432 and 433.

Thlaspi arvensis L. A very abundant and noxious weed in grainfields. Fort Saskatchewan, 444.

CAPPARIDACEAE

Peritoma serrulatum (Pursh) DC. (*Cleome serrulata* Pursh.) As far as the Edmonton area is concerned this seems to be an introduced species. I had not found it until 1939 when I collected it on the C.N.R. grade adjacent to Fort Saskatchewan. I planted seed from this colony in my garden, in 1940, and it has maintained itself there as an appreciated "weed" ever since, 1524, 4492 and 4503.

DROSERACEAE

Drosera rotundifolia L. On mossy hummocks in a bog 6 miles northwest of Winterburn, and about 10 miles west of Edmonton, 2680, determined by W. P. Fraser.

D. longifolia L. Bog near Wabamun, 35 miles west of Edmonton. Moss, 2768.

SAXIFRAGACEAE

Chrysosplenium iowense Rydb. Fairly common in peaty ground near bogs. Scotford Sandhills 9 miles northeast of Fort Saskatchewan, 471, 1670, 4366 and 4369.

Heuchera Richardsonii R. Br. This is the common species of the plains, around bluffs and in the open. Fort Saskatchewan, 466, 4892, 4896, 4897 and 4908.

Mitella nuda L. Common in low places in woods. Fort Saskatchewan, 472.

Parnassia montanensis Fern. & Rydb. Fairly common on low ground, shores of streams, edges of damp woods, etc. Fort Saskatchewan, 470, 1920 (determined by H. M. Raup) and 2210.

P. palustris L. var. **neogaea** Fern. (*P. multiseta* (Ledeb.) Fern.) Fairly common in wet places. Fort Saskatchewan, 1592 and 2165. Determined by H. M. Raup.

Ribes floridum L'Her. (*R. americanum* Mill.) Common in moist woods. Fort Saskatchewan, 513.

R. glandulosum Weber (*R. prostratum* L'Her.) Occasional in damp woods. Fort Saskatchewan, 516.

R. hirtellum Michx. (*Grossularia hirtella* (Michx.) Spach.) Low woods, as along wooded creek banks. Fort Saskatchewan, 512, 1727 and 2386.

R. hudsonianum Richards. Fairly common in low woods. Fort Saskatchewan, 514.

R. lacustre (Pers.) Poir. (*Limnobotrya lacustris* (Pers.) Rydb.) In low woods, not common. Fort Saskatchewan, 511.

R. oxyacanthoides L. (*Grossularia oxyacanthoides* (L.) Mill.) In low woods near Whitemud Creek, Edmonton, 2424. Determined by H. M. Raup.

R. triste Pall. Common in damp woods. Fort Saskatchewan, 515.

ROSACEAE

Agrimonia striata Michx. Common especially at edge of woods on low ground. Fort Saskatchewan, 569, 570 and 571.

Amelanchier alnifolia Nutt. Common in woods. Fort Saskatchewan, 577, 2381, 2406, 2544, 2545, 3000 and 3027; a low form of this is common on sandy knolls. Fort Saskatchewan, 2402, 2403, 2874, 3011, 3026, 3122, 3311, 3320 and 3652.

Chamaerhodos Nuttallii Pickering. Occasional along the C.N.R. grade, Fort Saskatchewan, 572, 1573, 1870 and 4491.

Cotoneaster melanocarpa Lodd. Growing in fair numbers as a garden escape in the Groat Ravine in Edmonton. Also noted in cultivation (Moss.), 5827.

Crataegus chrysocarpa Ashe. Occasional on roadsides or in woods. Fort Saskatchewan, 574, 575 and 576.

Fragaria glauca (S. Wats.) Rydb. Common everywhere on dry ground. Fort Saskatchewan, 593, 594 and 595, 1709 and 1759.

F. vesca L. var. **americana** Porter. (*F. americana* (Porter) Britton) Low woods, Fort Saskatchewan, 591 and 592.

Geum allepicum Jacq. var. **strictum** (Ait.) Fern. Common on high or low ground. Fort Saskatchewan, 588, 589, 590, 2067 and 3605.

G. macrophyllum Willd. var. **perincisum** (Rydb.) Raup. (*G. perincisum* Rydb.) Fairly common in wet ground. Fort Saskatchewan, 3555, 3564, 3600 and 3618.

G. triflorum Pursh. (*Sieversia triflora* (Pursh) R. Br.) Common everywhere. Fort Saskatchewan, 585, 586, 587 and 1774. The last number is var. *ciliatum* Fassett.

Potentilla Anserina L. (*Argentina Anserina* (L.) Rydb.) Common on low ground. Fort Saskatchewan, 547 and 547a.

P. Anserina L. var. **sericea** (Haynes) Fern. (*Argentina argentea* Rydb.) Occasional in wet places. Fort Saskatchewan, 546, 1743, 1877 and 2444.

P. arguta Pursh. Common on open ground. Fort Saskatchewan, 557, 558, 3005, 3031, 3050 and 3050a.

P. argyrea Rydb. Rare in Edmonton area. Only one colony found, on C.N.R. grade a few rods east of Fort Saskatchewan, 2940.

P. bipinnatifida Dougl. Fairly common on open ground. Fort Saskatchewan, 550, 551, 552, 1980, 2589, 2590 and 3108a.

P. concinna Richards. Rare in Edmonton area. Open, dry hillside above left bank of North Saskatchewan, River, 5 miles northeast of Fort Saskatchewan, 2373, 2374 and 2384.

P. gracilis ssp. **Nuttallii** (Lehm.) Keck. (*P. Nuttallii* Lehm.) Occasional on open upland. Fort Saskatchewan, 2017, 2535, 2613 and 3044.

P. Hippiana Lehm. Fairly common on dry prairie. Fort Saskatchewan, 542, 543 and 544.

P. norvegica L. Common on moist meadows, etc. Fort Saskatchewan, 540, 541 and 1889.

P. palustris (L.) Scop. Fairly common in bogs, Sandhills, 15 miles north of Fort Saskatchewan, 533, 534, 535 and 536; bog just east of Ma-Me-O Beach, Pigeon Lake, 5048.

P. pensylvanica L. Common on open ground. Fort Saskatchewan, 548, 549, 1957 and 2600.

P. pulcherrima Lehm. Fairly common on prairies. Fort Saskatchewan, 555, 556, 2591, 2592 and 2620.

P. rivalis Nutt. var. **Millegrana** (Engelm.) Wats. Fairly common in low places, Fort Saskatchewan, 538, 539, 2612 and 4742.

P. tridentata Sol. Sandy soil on Pine ridge northeast of Fort Saskatchewan, McCalla, 3511.

Prunus virginiana L. var. **melanocarpa** A. Nels. Common in woods. Fort Saskatchewan, 579 and 1205.

P. pensylvanica L. Common in woods, Fort Saskatchewan, 578.

Rosa acicularis Lindl. Common in and around woods. Fort Saskatchewan, 484, 486, 487, 490, 493, 494, 1254, 1343, 1421, 1437, 1512, 1557, 4749 and 4942.

R. arkansana Porter. (*R. suffulta* Greene) Common on dry prairies. Fort Saskatchewan, 496, 497, 509, 1346, 1425, 1436, 1538, 1601 and 4747.

R. Woodsii Lindl. Common around woods and to a less extent on open ground. Fort Saskat-

chewan, 524, 525, 529, 1288, 1335, 1353, 1366, 1554, 1569 and 4748.

Many tiny dwarf roses grow on dry knolls on open ground seeming to approach closely to *R. alcea* Greene. One spring I dug up about a dozen of these dwarfs and set them in my flower border and kept them cultivated. All dveloped within 2 years to be typical *R. Woodsii* Lindl.—up to 3 feet in height.

R. Woodsii Lindl. var. **hispida** var. nov. *Hypanthia et pedunculi hispida sunt, in quo ab illis speciei typicae differunt.* This variety is plentiful within easy collecting distance of Fort Saskatchewan in all directions. In this variety all stems in the clone have hispid fruit and peduncles, though the amount of hispidity varies considerably even on the same stem, Fort Saskatchewan, 478, 480, 478a, 1290, 1434, 1496, 1520 (Type) and 1551.

Rubus acaulis Michx. Common in boggy woods. Fort Saskatchewan, 568, 750a, 1665, 1699, 1918, 4401 and 4403.

R. Chamaemorus L. Fairly common in bogs. Fort Saskatchewan, (Sandhills and Elk Island Park), 562, 563 and 564; Forty miles west of Edmonton, 565.

R. paracaulis Bailey. I collected two specimens of this species at the edge of a bog beside the Edmonton-Jasper road about 55 miles west of Edmonton on Aug. 1, 1930. These were No. 567, and I took them to be uncommonly large specimens of *R. acaulis* Michx. In May 1940 I found a large colony of these plants in the shade of willows on low ground in the Scotford Sandhills, 8½ miles northeast of Fort Saskatchewan and sent specimens to L.H. Bailey. Mr. August J. Breitung had sent L.H. Bailey specimens of the same plants a few days earlier and on the strength of these two sets of collections Dr. Bailey founded the new species *R. paracaulis.* I later found a good colony of the species at Whitemud Creek in the west edge of South Edmonton. Scotford Sandhills, 1698, 1913, 2494, 2630 and 4425; Whitemud Creek, 1781, 2494 and 2572.

R. pubescens Raf. (*R. triflorus* Richards.) Common in woods. Fort Saskatchewan, 566, 1730 and 1887.

R. strigosus Michx. (*R. idaeus* L. var. *strigosus* (Michx.) Maxim.) Our common raspberry of woods and bluffs. Fort Saskatchewan, 559, 1989, 2031, 2257 and 2753.

Sorbus Aucuparia L. I found this apparently fully established and fruiting in the Groat Ravine in Edmonton far from any dwelling, perhaps carried there by birds. Edmonton, 4219 and 4244.

S. scopulina Greene. In aspen woods, on high ground about a mile east of Mulhurst on Pigeon Lake, 15 miles west of Edmonton and 30 miles south, 5033; Seba Beach, 55 miles west of Edmonton, Moss collection and determination, number not given.

Spiraea alba DuRoi. Fairly common, especially on low, more or less brushy places. Fort Saskatchewan, 581, 2016, 2069 and 2100.

S. lucida Dougl. Plentiful in the aspen woods on high, white clay soil east of Mulhurst, at Pigeon Lake, 15 miles west and 30 miles south of Edmonton, 5028, 5032 and 5038.

LEGUMINOSAE

Astragalus aboriginum Richards. (*Atelophragma aboriginorum* (Richards.) Rydb. River bank, Fort Saskatchewan, 611, 2420a and 2468. Determined by Dr. Hermann.

A. albertinum Hermann. Clay bank of North Saskatchewan River about a mile above Fort Saskatchewan, 2420 and 2481, determined by Dr. Hermann.

A. bisulcatus (Hook.) Gray. (*Diholcos bisulcatus* Rydb.) Road ditch 3 miles west of Fort Saskatchewan, on highway to Edmonton, 1281 and 2138; shore of Lake de May (plentiful there), 621, 622 and 623.

A. canadensis L. Fairly common on roadsides. Fort Saskatchewan, 624, 625 and 4521.

A. Drummondii Dougl. (*Tium Drummondii* (Dougl.) Rydb.) Occasional on dry hillslopes, Edmonton, 2457 and 2517; Fort Saskatchewan, 2921, and 3066; Oliver, 6 miles east of Edmonton, 4039.

A. eucosmus Robinson (*Atelophragma elegans* (Hook.) Rydb.) Fairly common, especially along the river bank, Fort Saskatchewan, 609, 1610 and 2486.

A. flexuosus (Hook.) Dougl. (*Phaca flexuosus* Hook., *pisophaca flexuosa* (Dougl.) Rydb.) Occasional on steep bare hillsides, Fort Saskatchewan, 618, 619 and 620; Edmonton, 2509.

A. frigidus var. **americanus** S. Wats. (*Phaca americana* (Hook.) Rydb.) Brushy roadside six miles northeast of Fort Saskatchewan, 626. Rare.

A. glabriusculus Gray (including *Atelophragma Herriotii* Rydb.) River banks in Edmonton and Fort Saskatchewan. Edmonton, 2449; Fort Saskatchewan, 2420b.

A. goniatus Nutt. (*A. hypoglottis* Richards.) Common on open land. Fort Saskatchewan, 612, 613 and 3535.

A. Macounii Greene. (*Atelophragma Macounii* Rydb.) A colony of this species was found on the right bank of the North Saskatchewan

River, about a mile southwest of Fort Saskatchewan, 2440, 2467, 2480 and 2936, determined by H.M. Raup and F.J. Hermann.

A. striatus Nutt. *(A. adsurgens* Pall.) Common on prairie. Fort Saskatchewan, 606, 607 and 608.

A. tenellus Pursh. Rare in Edmonton area. Three of four good colonies were found on the left bank of the river ¼ mile above the C.N.R. steel bridge near Fort Saskatchewan, 2945, 2980 and 3117.

Caragana arborescens (L.) Lam. A common "escape" from cultivation on roadsides and edges of lawns, waste places, etc. Fort Saskatchewan, 4940.

C. pygmaea DC. Cultivated widely as hedge material in Edmonton and other places in vicinity. Fort Saskatchewan, 4935 and 4935a.

Glycyrrhiza lepidota (L.) Pursh. Fairly common especially on hill slopes. Fort Saskatchewan, 599 and 599a.

Hedysarum alpinum L. var. **americanum** Michx. Common on open ground. Fort Saskatchewan, 666 and 667.

H. alpinum L. var. **philoscia** (Nels.) Rollins. Fairly common, especially in poplar woods, Fort Saskatchewan, 663, 664 and 665, determined by Reed Rollins.

H. Mackenzii Richards. Founds in the Edmonton area only along the river banks, suggesting that it is an eastward extension of range from the mountains. Fort Saskatchewan, 668, 668a and 669.

Lathyrus ochroleucus Hook. Common in woods. Fort Saskatchewan, 631, 632, 4377 and 4387.

L. venosus Muhl. Common in and around woods. Fort Saskatchewan, 629, 630 and 800a.

Medicago falcata L. In lawn in front of Medical building of University of Alberta in Edmonton, 1531, collected by McIntyre & McIntyre.

M. lupulina L. Weed on my lawn, Fort Saskatchewan, 643a. It has maintained itself there for many years.

M. sativa L. Escaped from cultivation. Common along roadsides, etc. Fort Saskatchewan, 644.

Melilotus alba Desv. Common on roadsides and waste places, Fort Saskatchewan, 646.

M. officinalis (L.) Lam. Common on roadsides and waste places. Fort Saskatchewan, 645.

Oxytropis gracilis (A. Nels.) Schum. Common on prairies. Fort Saskatchewan, 658 and 2528.

O. retrorsa Fern. Common on open ground. Fort Saskatchewan, 650, 650a and 651.

O. retrorsa Fern. var. **sericea** (T. & G.) Fern. Common along the river bank. Fort Saskatchewan, 647, 648, 648a and 659.

Petalostemum purpureum (Vent.) Rydb. Uncommon in Edmonton area. Sandy knoll 2 miles east of Fort Saskatchewan, 600; steep hillside above river 5 miles northeast of Fort Saskatchewan, 601 and 602. (Edg. Fordham farm.)

Thermopsis rhombifolia (Nutt.) Richards. Common on open land. Fort Saskatchewan, 641, 642, 4850 and 4936.

Trifolium hybridum L. Common on roadsides, and waste places. Fort Saskatchewan, 635.

T. pratense L. Occasional on roadsides, vacant lots, etc. Fort Saskatchewan, 633; Edmonton, 2311.

T. repens L. Occasional on roadsides etc. Fort Saskatchewan, 634.

Vicia americana Muhl. Common, especially around bluffs, Fort Saskatchewan, 660, 660a, 661 and 1742.

V. americana Muhl. var. **angustifolia** Nees. Occasional on open ground, Fort Saskatchewan, 662, 1743 and 1773.

V. Cracca L. Occasional as a weed on roadsides. Fort Saskatchewan, 659.

GERANIACEAE

Erodium cicutarium (L.) L'Her. Only one colony found, on a trail side 7 miles northeast of Fort Saskatchewan, on the north side of the North Saskatchewan River, 687 and 688.

Geranium Bicknellii Britt. Fairly common and widely spread, generally near woods. Lake de May, 686; Edmonton, 686a and 2456; Fort Saskatchewan, 685 and 3514.

G. Richardsonii Fisch. & Trautv. *(G. albiflorum* Hook.) Fairly common in or around woods. Edmonton, 684; Fort Saskatchewan, 683, 3065 and 3603.

LINACEAE

Linum Lewisii Pursh. Occasional in Fort Saskatchewan area, especially near the river. Open dry prairie ground near south bank of river 1½ miles below Fort Saskatchewan, 675, 676, 676a and 676b.

L. usitatissimum L. Occasional escape from cultivation. Probably not established anywhere. As weed in garden near Lake de May, not far from a seeded flax field, 673 and 674.

BALSAMINACEAE

Impatiens biflora Walt. Moist bed of Ross Creek, adjacent to Fort Saskatchewan on east, 2083; shore of Elk Island Lake, 20 miles east of Fort Saskatchewan, 2731. Very abundant and far-extending around this lake.

I. occidentalis Rydb. *(L. Noli-tangere* L.) Occasional in wet places in woods, 6 miles northeast of Fort Saskatchewan, 699 and 700.

POLYGALACEAE

Polygala Senega L. Common on native soil around Fort Saskatchewan, 689 and 690. Also around Edmonton, Moss, 989, 2856 and 6721.

EUPHORBIACEAE

Euphorbia Esula L. Noxious weed in grainfield 1 mile west of Fort Saskatchewan, 679 and 680.

E. glyptosperma Engelm. *(Chamaesyce glyptosperma* (Engelm.) Small). On bare racetrack, Fort Saskatchewan, 4296; gravel of C.N.R. grade near Fort Saskatchewan, (abundant and far-stretching there), 4299 and 4300; weed in my garden, 4297.

E. Helioscopia L. Persistent and farstretching weed along east-west road, 1 mile north of the North Saskatchewan River opposite Fort Saskatchewan, 677. It has become a bad weed in one or two pastures of which the writer knows. I believe it is poisonous to domestic animals.

E. serpyllifolia Pers. *(Chamaesyce serpyllifolia* (Pers.) Small). Nearly as common around Fort Saskatchewan as *E. glyptosperma* Engelm. Bare spot under fence 6 miles northeast of Fort Saskatchewan, 678; practically bare gravel of C.N.R. grade near Fort Saskatchewan, 4291 and 4303, (det. by H. Groh).

CALLITRICHACEAE

Callitriche autumnalis L. Common in sloughs and ponds. Fort Saskatchewan, 692, 1361, 2087 and 4199.

C. palustris L. Common in ponds beside Sturgeon River, 6 miles northeast of Fort Saskatchewan, 691; pond in Ross Creek, Fort Saskatchewan, 2068. Both these places are under running water in flood times, as after spring thaw.

EMPETRACEAE

Empetrum nigrum L. Only one colony found in bog 6 miles north west of Winterburn, which is a few miles west of Edmonton, 2684.

ANACARDIACEAE

Rhus Rydbergii Small. *(Toxicodendron Rydbergii* (Small) Greene). Occasional on dry ground, Fort Saskatchewan, 693, 693a, 696, 696a, 697, 1170 and 1329.

ACERACEAE

Acer Negundo L. var. **interior** Sarg. *(Negundo interius* Rydb.) Commonly found on roadsides and in gardens as an extension of planted areas. Fort Saskatchewan, 698.

MALVACEAE

Malva crispa L. Also perpetuates itself in gardens as a weed. Fort Saskatchewan, 706; Edmonton, abandoned garden, 4328.

M. parviflora L. Coll. L.E. Drayton, Picardville, 35 m. n.w. Edmonton, det. by E.H. Moss.

M. sylvestris L. Garden weed, occasional around Fort Saskatchewan. Perpetuates itself from year to year. My garden, 703 and 704.

Malvastrum coccineum (Pursh) A. Gray. *(Sphaeralcea coccinea* (Nutt.) Rydb.) Steep north bank of Sturgeon River, south of Bon Accord, about 12 miles northwest of Fort Saskatchewan, 701; steep east bank of Pilon Creek, 2½ miles west of Fort Saskatchewan, 2920.

CISTACEAE

Hudsonia tomentosa Nutt. Jack Pine sand ridge, 14 miles north of Fort Saskatchewan, 707 where fairly plentiful.

VIOLACEAE

Viola arvensis Murray. A persistent weed in my garden, Fort Saskatchewan, 715, 716 and 2081.

V. nephrophylla Greene. Fairly common in wet, boggy woods, Fort Saskatchewan, 711 and 712.

V. palustris L. Occasional in wet, shady woods 5 miles northeast of Fort Saskatchewan, 708, 709 and 1639.

V. pedatifida G. Don. Fairly common on prairies. Fort Saskatchewan, 713 and 714.

V. Rafinesquii Greene. Grain field near Edmonton, det. by E.H. Moss, no number.

V. renifolia A. Gray. Occasional in moist shaded places in coulee 6 miles northwest of Fort Saskatchewan, 1638a.

V. renifolia A. Gray var. **Brainerdii** (Greene) Fern. More common around Fort Saskatchewan than the species. Moist shady place, 2½ miles northeast of Fort Saskatchewan, 1368; Scotford Sandhills, 9 miles northeast of Fort Saskatchewan, 2394.

V. rugulosa Greene. Very common in and around woods in Edmonton area. Fort Saskatchewan, 717, 718, 719 and 720; ½ mile west of Fort Saskatchewan, 2884.

V. adunca Smith. Common on dry prairie and in moist shady places. Fort Saskatchewan

prairie, 724; Sandhills, 14 miles north of Fort Saskatchewan, 723; open sandy pasture land 2½ miles northeast of Fort Saskatchewan, 2392.

ELAEAGNACEAE

Elaeagnus angustifolius L. Sloping bank above right side of Groat Ravine overlooking river valley, Edmonton, 4353. Colony well established and far from planted area.

E. commutata Bernh. (*E. argentea* Pursh.) Common in all areas. River bank, Fort Saskatchewan, 727 and 727a.

Shepherdia argentea Nutt. Not seemingly native to Fort Saskatchewan area, but planted in a few lawns, and by rhizomes escaped into roadsides in a few places. Such roadside growth collected as 729.

S. canadensis (L.) Nutt. Common, especially on lowish ground near the rivers. River flat, Fort Saskatchewan, 728.

Hippophaë rhamnoides L. Growing as an "escape", river valley, Edmonton. Det. E. H. Moss.

ONAGRACEAE

Circaea alpina L. Occasional in wet shady woods, 5 miles northeast of Fort Saskatchewan, ¼ mile from mouth of Sturgeon River, 739.

Epilobium glandulosum Lehm. var. **adenocaulon** (Haussk.) Fern. Wet creek-bed, Fort Saskatchewan, 1096; wet shore of river, Fort Saskatchewan 738.

E. angustifolium L. Common in and around woods. Brushy roadside, Fort Saskatchewan, 737; near Elk Island Lake, 3655.

E. lineare Muhl. (*E. densum* Raf.) Fairly common and widely distributed. Fort Saskatchewan, 2615 and 2711; Whitemud Creek, in west edge of Edmonton, 1413; bog 55 miles west of Edmonton, 1095.

Gaura coccinea Nutt. Occasional in Edmonton, area, generally on very dry hill tops or hill slopes. C.N.R. Freight yards in Fort Saskatchewan, 2555; collected on several steep hill slopes around Edmonton, represented by 2077, 2456 and 2507.

Oenothera muricata L. Occasional in Edmonton area. Fort Saskatchewan, 736, 2622, 2693 and 2710.

O. pallida Lindl. (*Anogra Nuttallii* (Sweet) A. Nels.) Fort Saskatchewan, 733 and 734.

O. strigosa (Rydb.) Mack. & Bush. (*O. biennis* L. var. *canescens* T. & G.) Fairly widespread in its occurrence. Fort Saskatchewan, 2631, 2558 and 1979; Edmonton, 2650 and 2813.

HALORAGIDACEAE

Hippuris vulgaris L. Common in streams and sloughs. Shallow water in Sturgeon River, 740 and 741.

Myriophyllum exalbescens Fern. Common in lakes, sloughs and streams. Fort Saskatchewan, 742, 1359 and 4209; Pigeon Lake, 4674, 4686 and 4687.

ARALIACEAE

Aralia nudicaulis L. Common in and around woods. Aspen woods near Fort Saskatchewan, 743, 4946, 4951, 4954, Pigeon Lake at Ma-Me-O Beach, 5010.

UMBELLIFERAE

Carum Carvi L. Occasional in Edmonton area. Fort Saskatchewan, 747, 1854 and 4052.

Cicuta bulbosa L. Fairly common in bogs and other wet areas. Fort Saskatchewan, 748, 750, 2283 and 4497; Lily Lake, 1536.

C. Douglasii (DC.) Coult. & Rose (*C. occidentalis* Greene). Fairly common in wet places, River shores, Fort Saskatchewan, 751; Pigeon Lake, 5007 and 5027.

Heracleum lanatum Michx. Common in and around woods. Fort Saskatchewan, 746, 4843, 4859, 4950 and 4975. Pigeon Lake, 5015.

Osmorrhiza longistylis (Torr.) DC. (*Washingtonia longistylis* (Torr.) Britt.) Wooded bottom of Groat Ravine, Edmonton, 4448 and 4442.

O. obtusa (Coult. & Rose) Fern. (*Washingtonia obtusa* Coult. & Rose) Low poplar woods in Golf Course, Elk Island Park, 4498.

Pastinaca sativa L. Persisting in garden abandoned 10 years, 754.

Sanicula marilandica L. Common in moist woods. Fort Saskatchewan, 755; Elk Island Park, 5069. Edmonton, 5301.

Sium suave Walt. (Rhodora 17: 131, 1915) (*S. cicutaefolium* Schrank.) Fairly common in low wet places. Mulhurst on Pigeon Lake, 5026; wet creek bottom Fort Saskatchewan, 752, 753, 4983 and 5281.

Zizia aptera (Gray) Fern. (*Z. cordata* (Walt.) Koch.) (see Rhodora 41: 441-3, 1939) Common on open ground. Fort Saskatchewan, roadside, 745 and 3424.

CORNACEAE

Cornus canadensis L. Common in woods. Poplar woods, Fort Saskatchewan, 756 and 756a.

C. stolonifera Michx. Common in woods. Dry woods, Fort Saskatchewan, 757, 757a,

757b, 4857 and 4947; River bank of "The Island", 1½ miles below Fort Saskatchewan, 1620 and 1620a.

ERICACEAE

Andromeda polifolia L. Uncommon. Muskeg in Sandhills, 15 miles north of Fort Saskatchewan, 759, 4954; large bog just east of Ma-Me-O Beach, Pigeon Lake, 4656, 4913 and 5058.

Arctostaphylos Uva-Ursi (L.) Spreng. Common on sandy places. C.N.R. roadside, Fort Saskatchewan, 760 and 4812.

Chiogenes hispidula (L.) T. & G. Bog at Lily Lake, 21 miles N.W. of Fort Saskatchewan. Collected in 1926 or 1927 by Dr. E.H. Moss. Mislaid but he is sure of the collection.

Ledum groenlandicum Oeder. Common in bogs and low, wet woods, Fort Saskatchewan, 763.

Moneses uniflora (L.) A. Gray. Occasional in low, deep woods two miles northeast of Fort Saskatchewan, 769, 769a and 769b; south of Davis Lake, 1865.

Monotropa uniflora L. Rare in my experience. Edmonton, poplar woods ¼ mile east of the Normal School, 4285; poplar woods near Alberta University, 4262; poplar woods beside C.N.R. in Fort Saskatchewan, 4729.

Pyrola asarifolia Michx. Common in woods and sometimes on low open ground. Fort Saskatchewan, 765 and 765a.

P. chlorantha Sw. Cool woods in a coulee 6 miles northeast of Fort Saskatchewan, 768.

P. elliptica Nutt. Fairly common in aspen woods. Fort Saskatchewan, 764.

P. secunda L. Fairly common in woods. Fort Saskatchewan, 767 and 1375.

Vaccinium caespitosum Michx. Occasional on low, wet ground. Bog 15 miles north of Fort Saskatchewan in Sandhills, 774, 1724 and 4960. Edge of bog opp. Ma-Me-O Beach, Pigeon Lake, 5052.

V. canadense Richards. Common in sand around edges of bogs. Sandhills 15 miles north of Fort Saskatchewan, 775; Pigeon Lake, 5002 and 5011.

V. Oxycoccus L. (*Oxycoccus palustris* Pers.; *O. quadripetalus* Gilib.). Occasional in bogs. Bog 15 miles north of Fort Saskatchewan, 772; Bog 40 or 50 miles west of Edmonton, 771. Bog at Ma-Me-O Beach, Pigeon Lake, 4925.

V. Vitis-Idaea L. var. **minus** Lodd. Common in sand at edge of muskegs. Bog 15 miles north of Fort Saskatchewan, 770 and 4964; wet ground at Whitemud Creek, Edmonton, 2428.

PRIMULACEAE

Androsace puberulenta Rydb. (*A. septentrionalis* L. var. *puberulenta* (Rydb.) Knuth). Common on dry ground, often persists as a weed in fields and gardens. Fort Saskatchewan, 789 and 4374.

Dodecatheon pauciflorum (Durand) Greene. Common in wet places. Meadows near Fort Saskatchewan, 780, 781 and 1696.

Glaux maritima L. Fairly common on saline shores of lakes and sloughs. Edge of Davis Lake, 4 miles southeast of Fort Saskatchewan, 787.

Lysimachia thyrsiflora L. (*Naumburgia thyrsiflora* (L.) Duby). Fairly common in wet places. Shore of Sturgeon River, 776 and 778; shaded edge of Ross Creek, Fort Saskatchewan, 777; shaded roadside ditch in Scotford Sandhills, 9 miles northeast of Fort Saskatchewan, 4463.

Primula incana M.E. Jones. Fairly often found on low damp spots. Whitemud Creek, 1780; Fort Saskatchewan, 782, 783, 783a and 3994.

Steironema ciliatum Raf. Common in woods. Fort Saskatchewan ,779 and 4610.

Trientalis borealis Raf. (*T. americana* (Pers.) Pursh.) Wet woods in Sandhills, 14 miles north of Fort Saskatchewan, 784, 785, 786, 1232 and 4391. This is the only area where I have ever found this species.

GENTIANACEAE

Gentiana affinis Griseb. Low woods 4 miles east of Fort Saskatchewan, 794.

G. acuta Michx. Common in woods and to a lesser extent on open ground, Fort Saskatchewan, 790 and 791.

G. Macounii Holm. Scotford Sandhills, 15 miles northeast of Fort Saskatchewan, 2720; This is at the eastern end of this sand strip. Determined by A.E. Porsild.

Halenia deflexa (Sm.) Griseb. Occasional in low woods. Sandhills, 15 miles north of Fort Saskatchewan, 792; Pilon Creek near Fort Saskatchewan, 3637; Seba Beach, 45 miles west of Edmonton, 792a. Edge of bog opposite Ma-Me-O Beach, Pigeon Lake, 45 miles southwest of Edmonton, 5054.

Menyanthes trifoliata L. Fairly common in bogs. Bog in Sandhills 14 miles north of Fort Saskatchewan, 797; Bog just east of Pigeon Lake, 4666, 45 miles southwest of Edmonton.

APOCYNACEAE

Apocynum androsaemifolium L. Plentiful on high ground in many places in Edmonton

area, generally around woods, often becoming a serious weed in grain fields in light land, generally where it existed before the land was cleared. Fort Saskatchewan, 800, 800a, 801, 2078 and 2139; Edmonton, 2641.

A. cannabinum L. Plentiful on river bank of Edmonton area near Fort Saskatchewan, 2751, 2979 and 3079; Edmonton, 2454, 2642, 2678 and 2814.

A. sibiricum L. Locally plentiful on river bank adjacent to Fort Saskatchewan, 798, 799 and 2918. *(A. cannabinum* L. var. *hypericifolium* (Ait.) Gray.)

ASCLEPIADACEAE

Asclepias ovalifolia Delne. Common on open ground. Fort Saskatchewan, 802, 3491 and 4483.

CONVOLVULACEAE

Convolvulus arvensis L. Occasional as noxious weed in fields and roadsides. Near Fort Saskatchewan, 1934 (edge of grain field.)

C. sepium L. Occasional on dry banks. Fort Saskatchewan, 804; abundant on hill slope west of High Level Bridge in Edmonton (north side of river).

CUSCUTACEAE

Cuscuta Gronovii Willd. River valley, Edmonton, Moss, 1257 and 1258. Parasitic there on *Symphoricarpos, Monarda* and *Lathyrus venosus.*

POLEMONIACEAE

Gilia linearis (Nutt.) Gray. *(Collomia linearis* Nutt.) Common on low sod, Fort Saskatchewan, 4569, 807 and 808.

HYDROPHYLLACEAE

Phacelia Franklinii (R. Br.) A. Gray. In sand near a muskeg in the sandhills, 15 miles north of Fort Saskatchewan. Fairly plentiful there, 813, 1276 and 4966. Moss, 4240, from the same place.

BORAGINACEAE

Allocarya californica (F. & M.) Greene. Found by me only at the east end of Battle Lake, about six miles southeast of Ma-Me-O Beach on Pigeon Lake, nearly 50 miles southwest of Edmonton, 5900. This plant is rare in Alberta; only two other occurrences are known to me, one being 8 miles west of Calgary, where it was collected by W. C. McCalla, and the other at Mountain View, northeast of Waterton, where E. H. Moss found it.

Lappula americana (A. Gray) Rydb. Fairly common in and around woods in the Edmonton area. Fort Saskatchewan, 814 and 815.

L. echinata Gilib. Our commonest Lappula in the Edmonton area. Fort Saskatchewan, 817.

L. occidentalis (G. Wats.) Greene. Rather rare in the Edmonton area. Fort Saskatchewan, 2515, 4380 and 4457.

Lithospermum linearifolium Goldie *(L. angustifolium* Michx.) Found occasionally on dry, sandy prairie in Edmonton area, Fort Saskatchewan, 819, 2198, 2393, 2431 and 4388.

Lycopsis arvensis L. One fairly large colony on roadside sod half-way between Edmonton and Fort Saskatchewan, 2946 and 3047.

Mertensia paniculata (Ait.) Don. Common. Fort Saskatchewan, 818, 4376 and 4442.

LABIATAE

Agastache foeniculum (Pursh) Ktze. Common in moist wooded area. Fort Saskatchewan, 821, 4977 and 4986.

Dracocephalum menthaeflorum L. *(Moldavica menthaeflora* (L.) Rydb.) Weed on roadside and in cultivated field; quite extensive along one half mile of road near Fort Saskatchewan, 1218, 1501, 1502 and 4056.

D. Nuttallii Britt. *(Physostegia parviflora* Nutt.) Fairly common on moist soil, especially along streams. Fort Saskatchewan, 831 and 3211.

D. parviflorum Nutt. *(Moldavica parviflora* (Nutt.) Britt.) Fairly widespread weed. Nowhere abundant. Fort Saskatchewan, 833 and 3511.

Galeopsis Tetrahit L. A common weed in low places, noxiously so in low parts of some grain fields. Fort Saskatchewan, 829, 3639 and 4233.

Nepeta hederacea (L.) Trev. A weed in some gardens and lawns, an escape in some cemetaries Fort Saskatchewan, 830.

Lamium amplexicaule L. A bad weed in garden of Jack Loren, 3 miles east of Fort Saskatchewan, 1488.

Lycopus americanus Muhl. Wet shore of Sturgeon River 6 miles northeast of Fort Saskatchewan, 2293.

L. lucidus Turcz. Common in wet ground such as edges of sloughs and streams. Fort Saskatchewan, 822 and 2292.

Mentha canadensis L. var. **glabrata** (Benth.) Fern. *(M. glabrior* (Hook.) Rydb.) Common on low ground. Fort Saskatchewan, 823, 824 and 2020.

Monarda menthaefolia Benth. Common on open upland. Fort Saskatchewan, 820.

Scutellaria epilobiifolia A. Hamilt. *(Scutellaria galericulata* L.) Common in wet places. Fort Saskatchewan, 832 and 4059.

Stachys palustris L. var. **puberla** Jennings. *(Stachys puberula* (Jennings) Rydb.) Occasional on low ground, Fort Saskatchewan, 2024.

S. scopulorum Greene *(Stachys palustris* L. var. *pilosa* (Nutt.) Fern., Rhodora 45: 474, 1943) Common in wet meadows. Fort Saskatchewan, 827, 1347, 1991, 3598 and 3654.

SOLANACEAE

Datura Stramonium L. Waste gravel, Edmonton, (Communicated by E.H. Moss).

Hyoscyamus niger L. Found infesting one farm yard and adjacent roadside, 12 miles east and 1 mile north of Fort Saskatchewan, 3521 and 3576. Also on river flat in Edmonton, 4888 and 5257.

Solanum nigrum L. Weed in garden, Fort Saskatchewan, No. 3252 of 1942. Weed in garden in Edmonton, 5254, and weed in grainfield 4 miles S. of Fort Saskatchewan, 5255.

S. triflorum Nutt. Fairly common sometimes as a weed on cultivated land, roadsides, etc. Fort Saskatchewan, 835 and 3154.

Lycium halimifolium Mill. *(L. vulgare* Dunal) Steep slope of waste hillside above river Valley. Edmonton, 4848, 4890 and 4998 — an escape perhaps.

SCROPHULARIACEAE

Castilleja miniata Benth. Common around Edmonton area. Fort Saskatchewan, roadside, 847.

Chaenorrhinum minus (L.) Lang. (*Linaria minor* (L.) Desf.) Uncommon. Dry C.N.R. embankment, Fort Saskatchewan, 843.

Gratiola neglecta Torr. Fairly common on muddy margins of sloughs and lakes. Fort Saskatchewan, 844, 1914 and 4198; Lake de May, 845 and 1914.

Limosella aquatica L. Occasional in wet margins of sloughs. Fort Saskatchewan, 4192; Lake de May, 842 and 2000.

Linaria dalmatica (L.) Mill. Occasional as garden escape. Fort Saskatchewan, 3650 and 4341. Also growing wild in Edmonton on waste ground.

L. vulgaris Mill. Common as a roadside weed, and occasionally established as a persistent field weed. Fort Saskatchewan, 840 and 3498a.

Melampyrum lineare Lam. In sand at edge of bog, Sandhills 14 miles north of Fort Saskatchewan, 839 and 4961.

Orthocarpus luteus Nutt. Common on open sod. Fort Saskatchewan, 838.

Pedicularis groenlandica Retz. Occasional in wet places. Bog 10 miles northwest of Edmonton, 2682.

P. parviflora Smith *(P. palustris* L. var. *Wlassoviana* Bunge.) Fairly plentiful on north side of large bog just east of Ma-Me-O Beach, Pigeon Lake, 4681. Determined by A.E. Porsild.

Penstemon gracilis Nutt. Fairly common on open ground or in edge of brush. Fort Saskatchewan, 861, 3341 and 4055.

P. procerus Dougl. Common on low spots and "gumbo" spots on prairie. Fort Saskatchewan, 864, and 3492; Lake de May, 862 and 863.

Verbascum phlomoides L. Weed in garden on farm, 6 miles east of Fort Saskatchewan, 851, determined by H. Groh.

V. virgatum Stokes. Roadside ditch 4 miles northeast of Fort Saskatchewan, 850.

Veronica americana Schw. Fairly common on wet ground. Fort Saskatchewan, 855, 856, 1879, 4186 and 4475.

V. peregrina L. var. **xalapensis** (H.B.K.) Pennell. Common around sloughs. Fort Saskatchewan, 834, 1897, 3410 and 4396.

V. persica Poir. Found as a weed in Fort Saskatchewan in only one spot, 6020.

V. scutellata L. Fairly common in wet places, creek bed, edge of slough, etc. Fort Saskatchewan, 856 and 4186.

LENTIBULARIACEAE

Pinguicula vulgaris L. Wet ground at Whitemud Creek just west of South Edmonton, 1298 and 1493.

Utricularia vulgaris L. Fairly common in sloughs and ditches, creeks, etc. Creek cutting highway 10 miles south of Edmonton, 768 and 769; border of slough near Fort Saskatchewan 4293.

OROBANCHACEAE

Orobanche ludoviciana Nutt. *(Myzorrhiza ludoviciana* Rydb., *Aphyllon ludoviciana* A. Gray) In dry, sandy hilltop 5 miles northeast of Fort Saskatchewan, 2432; sandy hillside above Oliver Creek (left side) about 12 miles west of Fort Saskatchewan, 4038.

PLANTAGINACEAE

Plantago eriopoda Torr. Occasional on saline flats. Fort Saskatchewan, 871.

P. major L. Common on roadsides and waste places, Fort Saskatchewan, 872, 2937, 4253 and 4257.

P. major L. var. **asiatica** (L.) Decaisne. Also probably common. Fort Saskatchewan, 2418.

RUBIACEAE

Galium Aparine L. The only Alberta occurrence known to me is at New Serapta, south of Edmonton, on two farms, in cultivated fields, as a scattered weed, by Mr. Wylie of Leduc, 6025.

G. boreale L. Very common in poplar woods and on open ground. Fort Saskatchewan, 874, 4455, 4484, 4520 and 4535.

G. labradoricum Wieg. In bogs. Fort Saskatchewan, 4418, 4471 and 4477a.

G. trifidum L. Wet places in bogs, edges of lakes and streams. Fort Saskatchewan, 876, 4441, 4476 and 4476a.

Houstonia longifolia Gaertn. Common on open ground. Fort Saskatchewan, 873 and 3549.

CAPRIFOLIACEAE

Linnaea borealis L. var. **americana** (Forbes) Rehder. Common in deep woods. Fort Saskatchewan, 878 and 4906.

Lonicera glaucescens Rydb. Common in poplar woods. Fort Saskatchewan, 880, 4852, 4861, 4864, 4870 and 4933.

L. involucrata (Richards.) Banks. Common in poplar woods. Fort Saskatchewan, 881, 4869, 4881 and 4903.

L. tatarica L. (*Xylosteum tataricum* (L.) Medic.) Escaped from cultivation in many places. Fort Saskatchewan, 879.

Symphoricarpos albus Blake. (*S. racemosus* Michx.) Fairly common in and around poplar woods. Fort Saskatchewan, 1368, 1431 and 1511.

S. occidentalis Hook. Very common and widely spread. Fort Saskatchewan, 885, 1377 and 1483.

S. pauciflorus (Robbins) Britt.(*S. racemosus* Michx. var. *pauciflorus* Robbins). Common in and around poplar woods. Fort Saskatchewan, 1324 and 1528.

Viburnum eradiatum (Oakes) House. (*V. pauciflorum* Pylaie). Fairly common in poplar woods. Fort Saskatchewan, 882.

V. trilobum Marsh. (*V. Opulus* L. var. *americanum* (Mill.) Ait.) Common in poplar woods. Fort Saskatchewan, 883.

ADOXACEAE

Adoxa Moschatellina L. Occasional in low woods. Sturgeon River Valley, 7 miles northeast of Fort Saskatchewan, 887 and 2380; Island in Elk Island Lake, 20 miles east of Fort Saskatchewan, 2858.

SANTALACEAE

Comandra livida Richards. Occasional on sandy margin of muskegs in Sandhills, and similar situations. Sandhills, 14 miles north of Fort Saskatchewan, 281 and 1686.

C. pallida A.DC. Common in poplar woods and on open ground. Fort Saskatchewan, 279, 280, 2922 and 4510.

LORANTHACEAE

Arceuthobium americanum Nutt. Plentiful on *Pinus Banksiana* in Sandhills 14 miles north of Fort Saskatchewan, 277 and 278.

CUCURBITACEAE

Micrampelis lobata (Michx.) Greene. Waste ground, Edmonton, Moss, 6566.

CAMPANULACEAE

Campanula petiolata A.DC. (*C. rotundifolia* L.) Common in Fort Saskatchewan, 890 and 4943.

LOBELIACEAE

Lobelia Kalmii L. (*L. strictiflora* (Rydb.) Lunell.) Rare in my experience. Wet clay spot at Whitemud Creek, Edmonton, 1403; muskeg 6 miles north of Winterburn (a few miles west of Edmonton), 2683.

VALERIANACEAE

Valeriana septentrionalis Rydb. Occasional in damp places in woods. Fort Saskatchewan, 305, 886 and 4428.

DIPSACACEAE

Scabiosa arvensis L. On school grounds of Sunnyside School, 12 miles, N.W. of Fort Saskatchewan, and on roadside 4 miles south of Fort Saskatchewan, 888, 4944 and 5242. Moss, 4037 from "Meadow near Edmonton".

COMPOSITAE

Achillea lanulosa Nutt. Not as common in the Edmonton area as *A. Millefolium*. Fort Saskatchewan, 2079.

A. Millefolium L. Very common on roadsides, waste land, etc. Fort Saskatchewan, 1035, 1036 and 1999; also f. *rosea* Rand and Redfield. Fort Saskatchewan, 1037, and 2545; poplar woods just north of Pigeon Lake, 4655.

A. multiflora Hook. (*A. sibirica* Ledeb.) (See Rhodora 31: 219, 1929) Common in low woods in the Edmonton area, especially along the river banks. Fort Saskatchewan, 1038, 3143 and 3146.

A. Ptarmica L. Occasional escape from cultivation. Roadside near Ma-Me-O Beach, Pigeon Lake, far from any dwelling, 4661.

Agoseris glauca (Nutt.) Greene. Common on open prairie in the Edmonton area. Fort Saskatchewan, 983 and 1344.

A. scorzoneraefolia (Schrad.) Greene. The commoner *Agoseris* in the Edmonton area. Dry, open ground. Fort Saskatchewan, 982, 1314 and 4479.

Antennaria aprica Greene. Common on open ground over the Edmonton area. Fort Saskatchewan, 3335, 3377, 3388, 3413, 3435, 3469, 3478, 4025, 4371 and 4372.

A. campestris Rydb. Fairly common around woods, easy to confuse with *A. neglecta* Greene, whose pistillate stems grow much higher than those of *A. campestris,* sometimes as high as 14 inches. Fort Saskatchewan, 995, 3305, 3313, 3338 and 3339.

A. Howellii Greene. Fort Saskatchewan, 3452, 4029, 4043 and 4044; Ma-Me-O Beach, Pigeon Lake, 4922.

A. neglecta Greene. Common around poplar woods and in open ground. Fort Saskatchewan, 3379, 3397, 3440 and 3444.

A. nitida Greene. Most common *Antennaria* in the Edmonton area. It becomes a serious weed in old pastures, and on lawns. Fort Saskatchewan, 3363, 3390, 3398, 3455, 3487, 3489, 3501, 3516, 3546, 3571, 4030, 4408 and 4411.

A. oxyphylla Greene. Found in the Edmonton district only along the eastern side of Pigeon Lake and Battle Lake, quite widely extended there in a north south direction, 4920, 5492 and 5901.

A. pulcherrima (Hook.) Greene. Occasional in wet places. Whitemud Creek, Edmonton, 1046.

A. rosea (D.C.Eat.) Greene. This species has appeared in the Edmonton area only since 1941, when I first found it. It becomes yearly more common. Fort Saskatchewan, 2492, 3374, 3399, 3503, 3550 and 4472.

Anthemis tinctoria L. Well established as a roadside weed on a roadside, about a mile and a half east of Mulhurst on Pigeon Lake, 5023.

Arnica Chamissonis Lessing. Common on low ground in Edmonton area. Fort Saskatchewan, 958 and 959.

Artemisia Absinthium L. Has spread quite extensively beyond cultivation on roadsides, etc. Fort Saskatchewan, 973.

A. biennis Willd. Common on roadsides and waste places. Fort Saskatchewan, 979 and 980.

A. caudata Michx. Common on open prairie in the Edmonton area. Fort Saskatchewan, 968, 2391 and 2702.

A. dracunculoides Pursh. Common on dry prairie in Edmonton area. Fort Saskatchewan, 969, 970 and 971.

A. frigida Willd. Common on open ground, especially on dry hillsides. Fort Saskatchewan, 978.

A. gnaphaloides Nutt. Common on dry ground. Fort Saskatchewan, 1485, 4314, 4316 and 4321.

A. Herriottii Rydb. Quite common along the river bank and above it. Fort Saskatchewan, 974 and 3989.

Aster Brachyactis Blake. *(Brachyactis angustus* (Lindl.) Britt.) *(Aster angustus* Lindl. not Nees.) Fairly common on river shore and around sloughs, Fort Saskatchewan, 1072, 1073, 5275 and 5296.

A. coerulescens DC. Fairly common on wet ground. Fort Saskatchewan, 1081, 2136, 2202, 2794, 2795, 2799 and 2811.

A. commutatus T. & G. Dry hill tops or hill slopes. Fort Saskatchewan, 2779, 2822 and 3634; Edmonton, 2776, 2778, 2792 and 5248.

A. ericoides L. Common on open ground. Fort Saskatchewan, 1076, 1077, 2732, 2736 and 2784; Edmonton, 2809.

A. ericoides L. var. **prostratus** (Ktze.) Blake. Common on prairie ground. Fort Saskatchewan, 1075, 2733a, 2741, 2782 and 2825.

A. junceus Ait. Plentiful in some bogs. Fort Saskatchewan, 1078, 1079, 1080 and 2713; Pigeon Lake bog, 4667 and 5059.

A. laetevirens Greene. Fairly common in wet places, river and creek shores, spruce woods, etc., Fort Saskatchewan, 1082, 1084, 2121, 2161, 2161a, 2161b and 2202.

A. laevis L. Common on open dry ground. Fort Saskatchewan, 1071, 2827, 2829 and 2830.

A. Lindleyanus T. & G. Common around and in poplar woods. Fort Saskatchewan, 1066 and 2826.

A. modestus Lindl. Fairly common on low, damp ground especially besides brush. Fort Saskatchewan, 1092, 1092a, 1093, 1500, 2173, and 2303; Groat Ravine, Edmonton, 4220.

A. puniceus L. Fairly common in wet, brushy places. Fort Saskatchewan, 1089, 1090 and 1091.

A. Richardsonii Spreng. var. **meritus** (A. Nels.) Raup. Fairly common along the river shore near Fort Saskatchewan, 1056, 1059, 1060, 1061, 1062 and 2252.

A. umbellatus Mill. var. **pubens** A. Gray. *(Doellingeria pubens* (A. Gray) Rydb.) Occasional on low, wooded land. Fort Saskatch-

ewan River valley, 1086 and 3150; Seba Beach, about 45 miles west of Edmonton, 1085.

A. Wilsoni Rydb. Fairly common in poplar woods. Fort Saskatchewan, 2826, 2826a, and 3636. Perhaps *A. Wilsoni* should be considered as only a variety of *A. Lindleyanus.*

Bidens cernua L. *(B. glaucescens* Greene.) Common on borders of sloughs, lakes, streams and other wet places. Fort Saskatchewan, 903, and 904; Lily Lake, 4705.

Centaurea repens L. *(C. picris* Pall.) Fort Saskatchewan, 962. Only one colony found. It has existed there for 10 years, to my knowledge, in an old pasture whose owner never lets it flower.

Chrysanthemum Leucanthemum L. var. **pinnatifidum** Lecoq. & Lamotte. An occasional roadside weed. Fort Saskatchewan, 1014 and 1899; Pigeon Lake, 5031.

Chrysopsis villosa (Pursh) Nutt. Common on dry prairie ground. Fort Saskatchewan, 960, 961 and 4714.

Cichorium Intybus L. Abandoned garden, Fort Saskatchewan, 4217 and 4277.

Cirsium arvense (L.) Scop. A common noxious weed of grain fields, roadsides, etc. Fort Saskatchewan, 1004, 4201, 4263 and 4265.

C. Drummondii T. & G. Occasional colonies on prairie sod. Fort Saskatchewan, 1002 and 1003.

C. lanceolatum (Nutt.) Spreng. Only one colony found by me on a farm and roadside 12 miles northeast of Fort Saskatchewan, 3540 and 3589.

C. setosum (Willd.) Bieb. *(C. arvense* (L.) Scop. var. *integrifolium* Wimm. & Grab.) One small colony and one large colony of several acres found in different fields about 3 miles east of Fort Saskatchewan, 4236, 4267, 4271 and 4726.

C. undulatum (Nutt.) Spreng. Common on prairie sod. Fort Saskatchewan, 1000, 1000a and 1001.

Crepis runcinata (James) T. & G. Fairly common on low, saline meadows, Fort Saskatchewan, 1009, 1010 and 1011.

C. tectorum L. An abundant and noxious weed in the Edmonton area though first seen here by me in 1934. Fort Saskatchewan, 1012 and 1013.

Erigeron angulosus Gaudin var. **kamtschaticus** (DC.) Hara. *(E. elongatus* Ledeb., Rhodora 41: 388-390, 1939 and Rhodora 40: 344, 1938) Fairly common, generally in lowish woods such as on the river flat. Fort Saskatchewan, 1023, 3124a, 3198 and 4212.

E. canadensis L. A common weed in fields and on roadsides. Fort Saskatchewan, 1028, 1448, 2057 and 3963.

E. Drummondii Greene. Occasional on high dry ground or on rich slopes, Fort Saskatchewan, 1032, 1900 and 2989; Lake de May, 1031; Lamont 35 miles N.E. of Edmonton, 1251.

E. elatus Greene. Fairly often encountered arounds bogs and other low ground. Fort Saskatchewan, 3004, 3124, and 3578; Whitemud Creek, Edmonton, 1412.

E. glabellus Nutt. Common on native sod everywhere. Fort Saskatchewan, 133 and 1034.

E. lonchophyllus Hook. Fairly common in wet soil. Fort Saskatchewan, 1029, 2160, 2721 and 3632.

E. oligodontus Lunell. Occasional on native, open prairie sod. Fort Saskatchewan, 3484 and 4022.

E. philadelphicus L. Common, especially on wet soil. Fort Saskatchewan, 1026, 1027, 3988, 4195 and 4197.

E. ramosus (Walt.) B.S.P. var. **septentrionalis** Fern. & Wieg. Occasional on dry ground. Fort Saskatchewan, 1021, 1022, 1579 and 2661.

Gaillardia aristata Pursh. Common on roadsides and in grassy places. Fort Saskatchewan, 901 and 902.

Gnaphalium uliginosum L. Fairly common on wet edges of sloughs and streams. Fort Saskatchewan, 2044, 2179 and 2272.

Grindelia perennis A. Nels. Fairly common on low, hard, more or less saline soils. Fort Saskatchewan, 947 and 948.

Helenium macranthum Nutt. Fairly common in wet, shaded places. Fort Saskatchewan, 899 and 2191.

Helianthus aridus Rydb. Occasional along railway grades. Fort Saskatchewan, 894 and 1564.

H. lenticularis Dougl. Occasional on roadsides and vacant lots. Highway 10 miles south of Edmonton, 891; vacant lot, Edmonton, 1371.

H. subrhomboideus Rydb. Common on dry, open ground everywhere. Fort Saskatchewan, 846, 897, 898, 898a and 1563.

H. subtuberosus Bourgeau. Common on grasslands, usually on low ground. It sometimes persists as a weed in the lower parts of grain fields. Fort Saskatchewan, 895, 1450 and 1560.

Hieracium scabrinsculum Schw. Common on dry ground, often at edge of woods. Fort Saskatchewan, 1006, 1007 and 1008.

Iva xanthifolia Nutt. *(Cyclachaena xanthifolia* (Nutt.) Fresen.) Edge of garden on farm, 6 miles northeast of Fort Saskatchewan, 990 and 990a.

Lactuca biennis (Moench.) Fern. Rare in my experience. Fort Saskatchewan, 3128 and 3200; in wet low ground among willows. On a tiny island in Pigeon Lake, No. 5016.

L. pulchella (Pursh) DC. A common weed in grain fields and on roadsides, etc. Fort Saskatchewan, 1049 and 1050.

L. scariola L. var. **integrata** Gren. & Godr. Occasional but yearly becoming more common in the Edmonton area. Fort Saskatchewan, 3083 and 3196; Edmonton, 2774.

Liatris ligulistylis (A. Nels.) K. Sch. Fairly common on moist soil, often at edge of woods. Fort Saskatchewan, 966 and 967.

Lygodesmia juncea (Pursh) D. Don. Occasional on very dry hill-tops or slopes. Fort Saskatchewan, 900; Edmonton, 2508.

Matricaria Chamomilla L. Garden escape in a few places. Fort Saskatchewan, 1015.

M. inodora L. Occasional on roadsides. Fort Saskatchewan, 1017, 1018 and 3100.

M. matricarioides (Less.) Porter *M. suaveolens* (Pursh) Buchenau.) Fairly common. Fort Saskatchewan, 1016 and 4301.

Petasites palmatus (Ait.) A. Gray. Common in low woods. Fort Saskatchewan, 991, 1660, 1705, 2395 and 4365.

P. sagittatus (Pursh) A. Gray. Common on low ground in woods or in the open. Fort Saskatchewan, 993, 1644, 1912, 4352, 4353, 4360 and 4361.

P. vitifolius Greene. Fairly common in wet edges of bogs and wet places in woods. Fort Saskatchewan, 992, 1673, 2400, 4362 and 4413.

Prenanthes racemosa Michx. Occasional on roadside, by edge of woods or bogs. Fort Saskatchewan, 905, 2722, 3156 and 3235.

Rudbeckia hirta L. Clay roadside 50 miles east of Edson, 2218, collected by McIntyre & McIntyre. Found by me plentifully on roadside 60 miles W. of Edmonton, 5082.

Senecio eremophilus Richards. Fairly common on roadsides. Fort Saskatchewan, 1039, 1041, and 4202; Groat Ravine, Edmonton, 4245; thirty miles west of Edmonton, 1040.

S. palustris Hook. Common on shores of sloughs and lakes. Fort Saskatchewan, 1044, 1874 and 3423.

S. plattensis Nutt. Common on low ground. Fort Saskatchewan, 1046 and 4074.

S. vulgaris L. Common on roadsides, in gardens, waste places, etc. Fort Saskatchewan, 1042 and 1043.

Solidago decumbens Greene var. **oreophila** (Rydb.) Fern. Common in Sandhills and wooded river-banks in the Edmonton area. Fort Saskatchewan, 915, 919, 921, 3064, 3089 and 3184.

S. gigantea Ait. *(S. serotina* Ait.) Common around and in woods. Fort Saskatchewan, 3112, 3179a, 3192 and 3199.

S. gigantea Ait. var. **leiophylla** Fern. Common in and around rich woods. Fort Saskatchewan, 925, 928, 929, 3115, 3193 and 3227.

S. graminifolia (L.) Nutt. var. **camporum** Fern. Common on river shores and other wet places. Fort Saskatchewan, 910, 911 and 975a.

×**S. leiophallax** Friesner. *(S. gigantea* var. *leiphlylla* × *lepida* var. *fallax)* In Butler University Botanical Studies, 6:81, 1943. Fairly common in both the Edmonton and Calgary areas. Edmonton, 3226 (Type of species) and 3255; Calgary, 3704 and 3755.

S. lepida DC. Common on upland soils, generally in the vicinity of woods. Fort Saskatchewan, 3212a, 3228 and 3234; Edmonton, 3242 and 3246.

S. lepida DC. var. **elongata** (Nutt.) Fern. Common in vicinity of woods and in the open. Fort Saskatchewan, 3120, 3212, 3212a, 3216, 3221, 3227 and 3230; Edmonton, 3243; Pigeon Lake, 4663.

S. lepida D.C. var. **fallax** Fern. Common. Fort Saskatchewan, 923, 3114, 3119, 3164, 3173 and 3191.

S. missouriensis Nutt. Common on open ground. Fort Saskatchewan, 939, 942, 2011, 2046, 2151, 2586, 2697, 3078, 3084, 3086, 3099, 3101, 3107, 3111, 3138, 3145, 3153 and 3157.

S. nemoralis Ait. Common on open ground. It thrives in Sandhills as well as on pretty good soil. Fort Saskatchewan, 930, 934, 3175, 3175a and 3213.

S. lepida DC. var. **fallax** Fern. Common. Fort Saskatchewan, 944, 945, 1513, 3159 and 3186.

Sonchus arvensis L. A common noxious weed in grain fields. Fort Saskatchewan, 1053 and 1054.

S. arvensis L. var. **glabrescens** Wimm. and Stevens. Also common weed. Fort Saskatchewan, 3075.

S. asper (L.) All. Fairly common weed in grain fields. Fort Saskatchewan, 1051 and 1052.

Tanacetum vulgare L. Fairly common on roadsides. Fort Saskatchewan, 954.

Taraxacum erythrospermum Andrz. *(T. laevigatum* (Willd.) D.C.) Common weed of roadrides, lawns, etc. Fort Saskatchewan, 989.

T. officinale Weber. *(T. palustre* (Lyons) Lam. & DC. var. *vulgare* (Lam.) Fern.) Common on lawns, roadsides, fields and waste places. Fort Saskatchewan, 1734.

Tragopogon dubius Scop. Fairly common on roadsides, especially along the C.N.R. and in waste places. Fort Saskatchewan, 984; Edmonton, 1372. Becoming yearly more common.

ANNUAL MEETING OF THE OTTAWA FIELD-NATURALISTS' CLUB, 1948

REPORT OF COUNCIL

Since the last Annual Meeting there were six meetings of Council as follows, all held at St. Patrick's College: December 15, 1947, with 18 members present; February 21, 1948, with 16 members present; April 24, with 16 members present; September 28, with 14 members present; October 29, with 16 members present; and November 22, with 14 members present.

Appointments were made for 1948 as follows:

Editor of the Canadian Field-Naturalist — Dr. H. A. Senn.

Business Manager — W. J. Cody.

Chairman of Publications Committee — A. E. Porsild.

Chairman of Excursions and Lectures Committee — E. G. Anderson.

Chairman of Special Lectures Committee — I. L. Conners.

Chairman of Membership Committee — Dr. V. E. F. Solman.

Chairman of Reserve Fund Committee — E. F. G. White.

Chairman of Bird Census Committee — A. E. Bourguignon.

Chairman of Constitution and By-laws Committee — Father F. E. Banim.

Chairman of Library Committee — A. E. Porsild.

Chairman of Junior Members Committee — W. K. W. Baldwin.

Seven record books of the Club, covering the period from its foundation in 1879 to the end of 1939 were deposited in the Public Archives, Sussex St., where they may be consulted.

The West Elgin Nature Club was accepted as an affiliated Society.

Report of Publications Committee

Since October 3, six numbers of the Canadian Field-Naturalist have been published. These include the last number of volume 61, and the first five of volume 62. The total number of pages was 213. Papers, notes and reviews were distributed as follows:

	Papers	Notes	Reviews
Ornithology	10	15	18
Mammalogy	5	9	7
Botany	8	3	5
Invertebrate Zoology	3		
Entomology	1	1	2
Ichthyology	1	1	1
Herpetology	1		
Miscellaneous	7		3

Fifteen maps and 22 other illustrations were used.

A number of scarce numbers from the years between 1890 and 1906 were received from the Carnegie Library, Ottawa.

Addressograph imprints were compiled for a new mailing list, greatly facilitating the mailing of monthly issues.

Report of the Excursions and Lectures Committee

Three meetings of the Committee were held during the year. Four lectures were given as follows:

January 15 — Management of mammals in the National Parks of Canada, by Dr. A. W. F. Banfield.

February 12—And the Gatineau Hills look on, by Dr. Alice E. Wilson.

March 4 — Bird Magic in Mexico, by Dr. G. M. Sutton.

April 8 — Dinner meeting in cafeteria of Experimental Farm. Mr. M. B. Davis, Dominion Horticulturist, was the guest speaker. He gave an account of a visit to Scandinavia the previous summer. A popular feature of the evening was the Naturalists' Lobby arranged by Dr. Groves.

Between May 4 and May 26, four early morning bird walks to the Experimental Farm were held.

Seven Saturday afternoon excursions were held as follows:

Spring—

May 1 — Britannia.
May 8 — Billings Bridge.
May 15 — Experimental Farm.
May 29 — Val Tetreau and Fairy Lake.
June 6 — St. Pierre de Wakefield.

Fall—

Sept. 18 — Rideau River.
Sept. 26 — McKay Lake.

As the Council adopted the Audubon Screen Tours for the current season no arrangements for additional lectures were deemed necessary. The Committee has supported the Audubon Screen Tours by ticket selling and assuming responsibility for ushernig.

Report of Special Lectures Committee

It was decided early in the year that the Club should enter into contract with the National Audubon Society to bring their Audubon Screen Tours to Ottawa during the 1948-49 season. The enthusiasm with which the first two lectures in the series of five have been received by Ottawa audiences has been most gratifying. These were:

November 4 — From Coast to Crest, a film journey with Alexander Sprunt Jr. from the Gulf Coast of Texas through the Navajo country, the Grand Canyon, and along the Colorado.

December 2 — Canada West, by Bert Harwell, a travelogue of an unspoilt area from Juan de Fuca Straits to Victoria, Vancouver, and the Canadian Rockies.

The public response to the sale of season and single tickets for the lectures has been very encouraging to the Club in this new departure.

Report of Membership Committee

During the period from December 1947 to November 1948, 132 active and 15 associate members were enrolled in the Club. Of these, 93 had applied for membership on the form drawn up and circulated by the Committee. The co-operation of the Arctic Circle in sending forms to its members is gratefully acknowledged.

Report of Bird Census Committee

The Christmas Bird Census was taken on December 21st, 1947. A total of 31 species and 2605 individuals was reported. 28 members participated. The Bird Census Report for all of Canada was published in the March-April issue of the Canadian Field-Naturalist.

Report of Constitution and By-laws Committee

Three meetings were held, during which revision of the Constitution was completed, as well as about a third of the By-laws revision.

Report of Library Committee

Books and periodicals in dead storage at the Ottawa Public Library were examined, and many of them listed. Several valuable early volumes of important series were noted. The Committee feels that the books represent a very considerable value, and that more time will have to be spent on them before a complete list can be made. It suggests that the Club arrange to have all Natural History and Geological books removed to some suitable place where a list can be made, and the books then offered for sale to libraries and individuals at market price.

Report of Junior Members Committee

Two meetings of the Committee were held at which plans were drawn up for a club for boys and girls about 12 years of age. The aims of the club are to foster a love of wild life and to help in the understanding and conservation of nature. The club was named the Macoun Field Club in honour of John Macoun, who was active in the early days of both of the sponsoring institutions, namely, the National Museum of Canada and the Ottawa Field-Naturalists' Club.

Eight meetings of the club were held during the spring season between May 8 and June 26, and nine during the fall between September 25 and November 27.

On November 21st, a 15-minute radio broadcast was given over Radio Station C.F.R.A. The script, entitled "Saturday Mornings at the Museum", took the form of a round table meeting of club members.

(signed)

W. H. Lanceley, President. H. J. Scoggan, Secretary.

STATEMENT OF FINANCIAL STANDING
OTTAWA FIELD-NATIRALISTS' CLUB, DECEMBER 3, 1948

CURRENT ACCOUNT

ASSETS

Balance in Bank, Dec. 3, 1948	2256.50
Bills Receivable	79.53
	2336.03

LIABILITIES

Audubon Screen Tours (estimated)	894.00
O/S cheque	18.39
Balance	1423.64
	2336.03

RECEIPTS

Balance in Bank, Dec. 1, 1947		151.48
Fees:—		
Current	1415.65	
Advances & Arrears	257.76	
Assoc. Members	32.00	1705.41
Separates		260.80
Illustrations		24.90
Single & Back Numbers		592.31
Miscellaneous		65.76
Transferred from Public. Fund		51.00
Transferred from Reserve Fund		66.00
Audubon Screen Tours (Net)		1846.38
		4764.04

EXPENDITURES

Canadian Field-Nat.		1512.00
Editor		100.00
Curator		15.00
Separates		291.51
Illustrations		231.50
Postage & Stationery		236.28
Bank Discount		23.83
Exc. & Lecture Comm.		20.00
Miscellaneous		69.17
Annual Lecture (Net Loss)		26.64
Bal. in Bank	2256.50	
Less O/S cheque	18.39	
Corrected bal.	2238.11	2238.11
		4764.04

RESERVE FUND

ASSETS

Canadian Government Bonds	1800.00
Balance in Bank, Dec. 3, 1948	7.54
	1807.54

LIABILITIES

Nil

RECEIPTS

Balance in Bank, Dec. 1, 1947	211.17
Bond Interest	66.00
Bank Interest	1.09
	278.26

EXPENDITURES

Purchase of Bonds	201.72
Trans. to Current A/c	66.00
Rent Deposit Box	3.00
Bal. in Bank, Dec. 3, 1948	7.54
	278.26

PUBLICATION FUND

ASSETS

Canadian Government Bonds	1300.00
Balance in Bank, Dec. 3, 1948	53.56
	1353.56

LIABILITIES

Nil

RECEIPTS

Balance in Bank, Dec. 1, 1947	52.60
Bond Interest	51.00
Bank Interest	.96
	104.56

EXPENDITURES

Transferred to Current A/c	51.00
Bal. in Bank, Dec. 3, 1948	53.56
	104.56

C. Frankton,
TREASURER.

Audited and found correct
(signed) Harrison F. Lewis,
I. L. Conners,
AUDITORS.

December 3, 1948.

BIRD RECORDS FOR THE OTTAWA DISTRICT [1]

HOYES LLOYD
Ottawa, Ont.

1. *Ardea herodias herodias* Linnaeus.

EASTERN GREAT BLUE HERON. — On December 7, 1944, Dr. O. H. Hewitt brought me a live Great Blue Heron which had been picked up at Dow's Lake. It was too weak to fly and had starved to an almost helpless condition following the onset of winter. The temperature was below zero on December 4. This is a very late record for this district.

2. *Cygnus columbianus* (Ord).

WHISTLING SWAN. — Acting upon information received from Dr. A. L. Rand, A. E. Bourguignon and I drove to some ponds near Lake Deschenes, west of Britannia Bay, Ontario, on April 19, 1947, and there found a lone Whistling Swan feeding peacefully. It could fly well, but was not particularly wary, and allowed one approach by Bourguignon to within forty yards. The bird was looked for on the 20th, but not found. Bourguignon found it still there on April 27. This is apparently the second occurrence for the district.

3. *Branta bernicla hrota* (Müller).

AMERICAN BRANT. — On May 20, 1945, and on May 26, 1945, A. E. Bourguignon collected one specimen on the Ontario shore of Lake Deschenes, Britannia Bay, Ontario.. One is in his collection and one was donated to the National Museum. The Right Honourable Malcolm Macdonald reported to me that he saw a flock of sixty on the Ottawa River on May 22, 1945.

On May 7, 1946, Bourguignon reported that he had seen a flock of ninety birds on Lake Deschenes, just west of Britannia Bay. I found them there on the 8th and counted eighty-six birds, one group of fifty-five on a sandy point, and thirty-one farther away. They gathered sand or food just off shore, gracefully riding rather heavy waves. They swam along shore in close formation, once passing me within fifty yards. On May 14 I counted eighteen birds there, and on the 15th twenty birds.

Flight-Lieutenant Gilmour informed me by telephone at 4 p.m. on May 28, 1947, that the control tower at Rockcliffe Airport had just reported 200 birds flying east, down the Ottawa, at fairly low altitude. They were travelling in formation like geese and were so logged.

A. E. Bourguignon received a report of 200-300 Brant being observed on the Ottawa River between Cumberland and Rockland, Ontario, on May 30 and 31.

In 1948 Bourguignon reported to me that he saw 79 Brant at Lake Deschenes, May 24; 15 on May 25; and 15 on May 26. They had left when I looked for them on the 27th.

(The following report from the Rockcliffe Airport may refer to this species. On June 17, 1947, a flock of large grey birds that resembled geese flew up the Ottawa River at low level, then rose to 2000-3000 feet and continued due west. This would be a very late date for Brant to be passing Ottawa.)

4. *Aix sponsa* (Linnaeus).

WOOD DUCK. — The first definite Ottawa breeding record of which I am aware is afforded by the fact that Dr. O. H. Hewitt and I found a brood of eight half-grown young ones with the female at the Petrie Islands on August 22, 1944. When closely followed seven of the brood escaped easily by hiding in rushes, and one by making a dash across open water.

5. *Melanitta fusca deglandi* (Bonaparte).

WHITE-WINGED SCOTER. —A male of this species was picked up in a field near the radar station, Billings Bridge, by S. A. Gardiner on May 24, 1947. It was injured and was handed to Ontario Game Officer Wayne Robinson who turned it loose in the waterfowl enclosure, Central Experimental Farm, where A. E. Bourguignon and I saw it alive.

6. *Aquila chrysaëtos canadensis* (Linnaeus).

GOLDEN EAGLE. — A specimen in the Bourguignon collection was picked up dead at Rockland, Ontario, on August 28, 1930. It had been electrocuted by shorting a high

[1]) Received for publication Aug. 14, 1948.

tension power line. No break in power was caused and the bird was not badly burned.

7. *Perdix perdix perdix* (Linnaeus).

EUROPEAN PARTRIDGE — At 4 p.m. on February 27, 1947, a cloudy winter afternoon with east wind and light snow, A. E. Bourguignon and I spent some time observing a flock of six of these birds which was in a weedy field near Britannia Bay. First, we noticed two birds, then four more popped out from beneath the snow. Three of these were so close together that their heads emerged in one tight group. As we watched with our glasses we saw their manner of going under the snow and emerging, time and again. They may have been feeding, or preparing to roost, or both. To dig in, a bird would take two or three pecks at the crust, then work vigorously with the feet, sending the snow back two feet or more. As it did this the bird sank vertically, disappearing in about two or three seconds. One would think it had gone down in an elevator! Several times beaks would be pushed above the snow and quickly drawn under. Emergence was even quicker than digging in: the bird popped into view, shook itself, and began feeding. The entire performance was reminiscent of the disappearing act of grebes, as the birds dropped below the snow line, and again, one thought of grebes as the partridges would push up the tips of their beaks and promptly pull them down again. This habit can scarcely have been developed in their European home and may have been acquired. Its usefulness in a deep snow area is obvious.

8. *Numenius phaeopus hudsonicus* (Latham).

HUDSONIAN CURLEW. — At five o'clock on the afternoon of May 27, 1944, during an excursion of the Ottawa Field-Naturalists' Club, fifty large, long-billed shorebirds flew north over MacKay Lake, travelling in perfect V-formation. They were seen by me, by C. H. D. Clarke, and many others. They could not be certainly identified, in fact Clarke did not see the long beaks, but I believe that they were almost certainly of this species. Flight formation, size of birds, and the date, which is that when these Curlew would be expected here, offer some confirmation.

On October 5, 1945 a large shorebird flew from the edge of Lake Deschenes, near Britannia Bay, Ontario, and crossed the highway ahead of me. It was approaching at an angle and gave me a fairly good view at close range as it passed in front of me. The size and the outline, including long down-curved bill, make me feel certain that it was of this species.

On the morning of May 26, 1947, Flight-Lieutenant R. A. Gilmour, the traffic control officer at the Rockcliffe Airport, telephoned Dr. H. F. Lewis that large shorebirds had just been seen there. I drove to the airport at once and was taken on a tour of all the runways, but the birds had gone, having been frightened by aircraft. The four birds had been standing on the runways and were well enough described to make me feel they were Curlew — probably Hudsonian.

That same afternoon A. E. Bourguignon and I searched likely countryside near Britannia hoping to find Curlew. Two were seen by me on the shore-line, and one was taken as a specimen. The next morning, May 27, 1947, Bourguignon collected a specimen in the same vicinity. It was on the 27th three years previously that the flock of 50 was seen, and this species, elsewhere in Ontario, is known to arrive with great regularity as to date.

9. *Calidris canutus rufus* (Wilson).

AMERICAN KNOT. — I saw nine at Britannia Bay, Ontario, on May 30, 1945.

10. *Erolia alpina pacifica* (Coues).

RED-BACKED SANDPIPER. — This species, recently reported by me as rare, was abundant during Spring migration in 1945. More shore line than usual was available on Lake Deschenes because of low water. These birds were observed on the Ontario shore of the lake by Bourguignon and me from May 24 to June 3, with the height of the migration on May 30 and 31. I observed 44 on May 30 and 80 on May 31.

11. *Stercorarius parasiticus* (Linnaeus).

PARASITIC JAEGER. — There is some slight doubt about the species of Jaeger to which the following incidents relate. However, the facts are as given.

On June 2, 1945, Wilmot Lloyd and I visited the Ontario shore of Lake Deschenes, beyond Britannia Bay. Two birds were noticed far out over the lake flying fantastic hawk-like evolutions. It took some time to see what was happening, but, in short, two Jaegers were teaming up to pursue and capture small

birds. An occasional Starling crossed the lake, but Purple Martins were feeding in all directions over the lake surface, and probably the Jaegers were feeding on Martins. One Jaeger would fly towards the victim, then another, as the unfortunate dodged. It had no chance against these superb aerial acrobats. One caught it, let it go, the other picked it out of the air with ease; this was repeated several times and then, tiring of the cat and mouse play the Jaegers would alight on the water and the victim was eaten in a moment.

On the water, the Jaegers sat high; one was white below, one golden. The white one had a long white neck and black cap. The side of its head was white. Once while the bird was in the air I thought it had long tail feathers: on the water, the tail seemed only as long as the wings. The backs of both birds appeared black.

After feeding, the two spent a long time in a courtship performance on the water. I took the light bird to be the male. He would swim facing the female, bob his head up and down strongly four or five times, then she would bob slightly and turn away. He would swim close along side, turn so that he faced her, and bob again — all repeated indefinitely.

The two were about the size of a Ring-billed Gull; the flight both hawk-like and gull-like: the aerial turns were distinct from those of hawks and gulls.

The next day Dr. A. L. Rand and A. E. Bourguignon saw two Jaegers in this vicinity.

On June 6th Bourguignon and I went to the same vicinity and he collected a female Long-tailed Jaeger, *Stercorarius longicaudus* (Bourguignon, Canad. Field-Nat., Vol. 61, No. 3, p. 117). Its long tail was recognized immediately it was seen. This was a light-coloured bird, and a female. It had been feeding on worms. The probable female of the pair seen on June 2 was in the dark phase of plumage[2] and the two were feeding on birds. My opinion is that the June 2nd birds were Parasitic Jaegers.

12. *Larus hyperboreus* Gunnerus.

GLAUCOUS GULL. — J. E. V. Goodwill found one on the Rideau River on November 24, 1945, and it was seen there by R. Frith, A. E. Bourguignon, and me on November 25. It was definitely larger than the Herring Gulls and slower in wing action. Both species could be seen in the field of X8 glasses at the same time. I noted it as a large gray gull, pale gray above, front edge of wings white, outer tail feathers white, wing tips paler than the general pale bluish gray of the plumage, there was no black on the wings, the feet were rose pink, and the bill greenish yellow: probably a sub-adult bird.

13. *Hydroprogne caspia* (Pallas).

AMERICAN CASPIAN TERN. — A. E. Bourguignon and I saw one travelling steadily along the shore of Lake Deschesnes on May 30, 1946. Its size, black cap, and red bill were the chief identification marks.

14. *Tyto alba pratincola* (Bonaparte).

AMERICAN BARN OWL. — A specimen in the Bourguignon collection was taken in a horse stable on By-ward Market, Ottawa, October 2, 1943.

15a. *Bubo virginianus wapacuthu* (Gmelin).

ARCTIC HORNED OWL. — A female in the National Museum collection, taken by J. K. Bradley near Ottawa on December 3, 1937, is of this sub-species, although it is darker than specimens of the sub-species from Western Canada. Another, taken at Constance Bay by D. Blakely on November 19, 1917, is intermediate between *virginianus* and *wapacuthu*. One in the Bourguignon collection, a male, taken on December 11, 1928, has been identified by Rand as of this subspecies.

b. *Bubo virginianus heterocnemis* (Oberholser).

LABRADOR HORNED OWL. — Two specimens in the National Museum collection, a female taken by Wm. Macoun at the Experimental Farm, March 1927, and a female taken by Dr. Mulligan at Ottawa on March 26, 1928, have been identified as this subspecies. (The breeding form at Ottawa is a tawny, medium-dark bird, typical *B. V. virginianus.)*

16. *Perisoreus canadensis canadensis* (Linnaeus).

EASTERN CANADA JAY. — Another spring record is furnished by a specimen taken near Britannia Bay, Ontario, on April 11, 1945, by A. E. Bourguignon.

17. *Cistothorus platensis stellaris* (Naumann).

2) Moreover, the dark phase in adults of longicandus is excessively rare. W.E.G.

SHORT-BILLED MARSH WREN. — Two specimens were taken from a small colony in a grassy marsh on the edge of the Mer Bleue on June 20, 1947.

18. *Vireo griseus noveboracensis* (Gmelin).

NORTHERN WHITE-EYED VIREO. — The first record of this species for the Ottawa district was made on April 7, 1947, when R. Valois of Westboro picked one up dead near his home. This occurrence was at the time of the extraordinary flight of Southern species found at Toronto. The specimen was preserved as a mounted bird and was examined at the taxidermist's by Dr. C. H. D. Clarke, A. E. Bourguignon and me. (There are only six prior Canadian records for this species, all in extreme southern Ontario).

19. *Oporornis philadelphia* (Wilson).

MOURNING WARBLER. — A nest was found in a tangle of oriental poppy and rocket in my garden on June 26, 1947, containing at that time two small young and two eggs. It was only a few inches above the ground at the base of an oriental poppy. On July 12 the young had left and the nest with one warbler and one cowbird egg was collected. It is bulky, and coarsely constructed of grass stems, old leaves, lined with finer dead grass and rootlets. They have probably nested nearby before, the birds having been regular garden visitors for a long time. In this case the nest was found only by chance.

20. *Richmondena cardinalis cardinalis* (Linnaeus).

EASTERN CARDINAL. — Late in December, 1945, Dr. O. H. Hewitt learned that a Cardinal had been visiting the bird feeding station of Mrs. A. T. J. Watts, 60 Craig St., Ottawa, since about December 16. It was seen there by A. E. Bourguignon on December 30, 1945; I saw it on January 22 and 23, 1946; and it was seen by many others. On February 19, 1946, it was picked up dead, frozen solid, on a verandah near the feeding station. The specimen was given to me for post mortem examination by Dr. Hewitt. Its stomach was full and it was moderately fat. It died from a brain hemorrhage probably caused by flying into some object.

On July 26, 1947, one, believed to be a female, came to our garden, being attracted by either a caged canary, or by a wooden cardinal which acted as a decoy, or both. It was seen by Wilmot Lloyd daily until July 29, and by me almost daily from August 2 until August 21. A visitor from Washington, D.C. said that the song was that of the female Cardinal. It seemed to spend most of the time in the immediate vicinity of the garden, and was noticed feeding on the fruit of ironwood *Ostrya virginiana*.

NOTES ON THE MAMMALS OF LION'S HEAD, BRUCE PENINSULA, ONTARIO [1]

FRED WARBURTON

Owen Sound, Ont.

LION'S HEAD, a village of about 250, is situated on the eastern shore of the Bruce Peninsula, a narrow tongue of land separating the southern portion of Georgian Bay from Lake Huron. The village is about twenty miles north of Wiarton, and is slightly south of half way between that town and the village of Tobermory at the extreme north of the peninsula.

In the winter and spring of 1947 I spent several months in Lion's Head. Winter snow and the necessities of my work kept me in or near the village and prevented an extensive faunal study of the peninsula as a whole, but as so little has been published concerning the region I believe that my observations of the mammal life, localised though they are at Lion's Head, may be of interest.

Acknowledgement is due to the generous assistance of Dr. A. L. Rand who identified many of the specimens and supplied all of the trinomials used below. Without the assistance of Miss Retta Warren of Lion's Head this paper would have been impossible. Much of the data concerning the rare mammals was given to the writer by Mr. Sherman West, also of Lion's Head, whose life in the peninsula has qualified him to answer many questions which my brief stay left unanswered.

1. Received for publication September 8, 1947.

TOPOGRAPHY OF THE AREA

The area studied includes all the land within two or three miles of the village of Lion's Head. The shoreline curves north-east and south-east from the village, rising to high cliffs which drop to a rocky beach and are capped by borders of mixed cedar and birch forest, the trees in which would average less than thirty feet in height although occasional individuals would exceed that limit. Inland this mixed forest borders in some places on semi-cultivated maple bush, in others on pasture lands. The soil in the bush is very shallow. Large areas of bare limestone are often exposed or partially covered by moss and debris in which herbaceous plants grow thinly. These rocks are also marked by deep crevices which offer shelter to burrowing mammals. North of the village the mixed bush belt extends only a few hundred yards back from the shore, growing among flagstone-like fragments of limestone not covered by soil, and so supporting little animal life. This belt of bush borders on a stony pasture containing scattered clumps of small cedars, beyond which is a small area of meadow which exists in spring as a small pond but later becomes dry. South of this the land west of Lion's Head is intensively cultivated, used chiefly for hay, grain, and pasture.

ANNOTATED LIST

This list is not intended to be complete. Several species probably occur which I did not find during my rather brief residence at Lion's Head. Species named in parentheses were not actually found by the writer in the area studied.

Star-nosed Mole
Condylura cristata. — I obtained only one specimen, an adult male given to me by some boys in May, 1947, and unfortunately too badly decomposed to be preserved. I found burrows and mounds, probably of this species, in a sugar bush south of the village. It is undoubtedly greatly restricted in its range by the extreme shallowness of the soil in many of the wooded areas. It could hardly exist in the cedar-birch belt near the shore north of the village. Much of the deciduous bush would seem to offer a suitable habitat.

Smoky Shrew
Sorex fumeus fumeus. — Very common. Several were trapped in the damper parts of the cedar-birch belt, although it was not commonly found in the drier sections above the cliffs. One was seen hunting beneath a large stone in a garden inside the village. None of the local residents were familiar with them. Several believed them to be young moles when shown specimens.

Short-tailed Shrew
Blarina brevicauda talpoides. — Moderately common. Several specimens were trapped in the cedar-birch belt south of the village, often in runways beneath the snow. Two specimens, a male and a female, were taken on consecutive nights, April 15 and 16, 1947, in a barn within the village. That two of these ferocious little animals should be found together would seem to indicate that they were breeding at that time. No mice were found in this barn, although they were common enough in other barns in the area. The shrews may have prevented their presence. Very few of the local residents were acquainted with these animals. They were locally known as either moles or "shrew-mice".

Rand (1947, letter) states that my Lion's Head specimens are practically topotypical.

Little Brown Bat
Myotis lucifugus. — Two specimens were given to the writer. One had been killed by boys in late May. The second was found among the shingles of a house being repaired, late in June, and had apparently been dead for a long time. No caves suitable for bat hibernation exist in the area covered by this paper. In spring and summer small bats are common in and about Lion's Head. Most of those seen were probably this species.

Big Brown Bat
Eptesicus fuscus. — An adult male of this species was given to the writer in early June, 1947, having been killed after entering a house in the village. In late January a bat was reported several times in the woodshed of the Lion's Head United Church. Questioning of the observers indicated it to be this species.

(Black Bear)
(Ursus americanus). — None were reported from the area covered by this paper, but an adult and two cubs were killed at Monument Corners, seven miles north of Lion's Head, in the spring of 1947.

Raccoon
Procyon lotor. — Scarcity of tracks would indicate that this is not a very common species. One was shot about two miles south of Lion's Head in March, 1947, "in mistake for a young wolf".

Canada Skunk
Mephitis mephitis. — Moderately common around Lion's Head, sometimes found well within the village where it is anything but popular.

Woodchuck; Groundhog
Marmota monax. — Common in and about the edges of deciduous woodland where rock crevices offer substitutes for burrows. It does not occur in the denser bush areas and is artificially controlled by hunting in the intensively cultivated areas. North of the village the rocky nature of the soil near the shore and the spring flooding of the meadow area would prevent very frequent occurrence there.

Chipmunk
Tamias striatus. — Moderately common at the edges of the cedar-birch forest, where, like the groundhog, it utilizes natural rock crevices although it must often burrow through moss and debris to reach them. Lack of suitable habitat would seem to prevent its spreading to other areas.

Red Squirrel
Tamiasciurus hudsonicus. — Common in the wooded areas, especially cedar-birch. It remains inactive for long periods in winter.

(Black Squirrel; Grey Squirrel)
(Sciurus carolinensis). — Very rare. Many of the local residents have never seen one. Mr. West states that he saw one several years ago several miles north of Lion's Head, but has never seen them in or near that village.

(Flying Squirrel)
(Glaucomys sabrinus).—Mr. M. West tells me that this species sometimes occurs in the hardwood bush but its numbers have been greatly lessened by the destruction of the larger, and especially the hollow trees.

Deer Mouse; White-footed Mouse
Peromyscus maniculatus gracilis. — Very common. It often makes its way into cottages in winter and spring. Several were trapped in runways under the snow in winter, while others were captured while travelling along poles a few inches above the surface of the snow. Piles of logs apparently supply many with shelter during the winter. On one occasion a specimen of this species and a short-tailed shrew were taken from the same pile of poles in two consecutive nights. Whether the two had resided peacefully together I have no way of knowing. Perhaps the mouse moved in when the shrew was killed. Another specimen was taken in a woodpile well within the village in January, 1947.

Cooper's Lemming Mouse
Synaptomys cooperi cooperi. — One specimen was taken, an adult male from beneath a snow-covered brush pile in the cedar-birch belt about one mile east of Lion's Head on January 25, 1947. As on many other occasions the runway was well concealed below the snow and was only discovered by accident when my foot broke through the crust.

Meadow Mouse
Microtus pennsylvanicus pennsylvanicus. — Fairly common in the more open areas. I have seen it on several occasions in gardens in the village. No conspicuous damage to trees or shrubs was noticed in the spring. One individual, a sub-adult male, was found on top of the snow behind the school, apparently suffering from starvation and exposure. When supplied with food and warmth it revived rapidly and survived for several days, finally being killed for a specimen.

House Mouse
Mus musculus. — Fairly common within the village although apparently neither so numerous nor so destructive as the next species.

House Rat
Rattus norvegicus. — Very common within the village and on nearby farms. It does considerable damage and often finds its way into wells where the drowned bodies pollute the water and cause inconvenience and possibly danger of disease.

American Porcupine
Erethizon dorsatum. — Fairly common, in the cedar-birch belt. Stripped trees and trough-like tracks in the snow are commonly observed signs of their presence.

Snowshoe Hare
Lepus americanus. — Fairly common. In winter they sometimes come into the village at night.

NOTES AND OBSERVATIONS

Forest Advance in North and Central British Columbia. — Moss[1] has shown that much of the aspen parkland of central Alberta has developed in very recent times on soils with a typical grassland profile. In Northern and Central British Columbia also it is now apparent that the aspen forest is advancing into the grassland, especially in the intermountain valleys and plateaux between the Coast Range and the Rocky Mountains. In the southernmost parts of the Province the ecotone appears to be more static.

The grassland areas in question are scattered, are often limited by virtue of a fairly rough topography and only in a few instances involve large areas. Bunchgrasses are dominant. In south central sections *Agropyron spicatum* var. *inerme* is a common species, and in more northerly sections *Festuca scabrella* and, sometimes, *Calamagrostis* sp. may predominate. Not infrequently the dominant grasses are *Stipa columbiana* and *S. Richardsonii*. The tree commonly characterizing the advancing forest is the aspen *(Populus tremuloides)*. Aspen, however, is often succeeded by lodge-pole pine *(Pinus contorta)* and other conifers (esp. *Picea* sp. *glauca?)*. Sometimes a shrubby vegetation *(Rosa, Symphoricarpos,* etc.) precedes the aspen; in the higher latitudes the scrub birch *(Betula glandulosa)* and the willow may herald the advance.

As in Alberta, degraded grassland soil profiles are found in areas now forested. Degradation of the black-topped grassland profile to the grey-topped profile of the aspen and coniferous forest appears to be a fairly rapid process, often effected within a century. The records, too, of the early Hudson's Bay Company factors and the early explorers in the region point to the existence of grasslands at an earlier date in areas now forested. Douglas fir *(Pseudostuga taxifolia)*, in the interior, a tree of sub-humid habitat, is found in occasional relict stands north of its common range, and there is some evidence obtained from stumps and fallen logs that fir forest has been replaced by spruce in localities in north central British Columbia. In more southerly locations in British Columbia it is not uncommon to find large trees of Yellow pine *(Pinus ponderosa)* and Douglas fir, which are further south associated with the ecotone, now surrounded by large acreages of aspen. Frequent occurrence of species characteristic of the open grassland, seemingly in relict stands in the aspen forest, also might indicate an advance of the trees.

Explanation of the advance of the forest as Raup[2] has pointed out is not easy. Fire and grazing successions scarcely satisfy all of the many observations in British Columbia. The advance may be one of long duration, for bison remains found by Cowan[3] in, presumably, a post-glacial shallow bog at Atlin in northeastern British Columbia might indicate the earlier presence of more open vegetation. The present advance, however, seems to have commenced within the last hundred years. Perhaps it is more than coincidence that during the same period the glaciers have undergone accelerated retreat and that the timberline, which at latitude 50°, is ca. 5,000' in the Coast Range and ca. 7,500' in the Interior mountains, has moved upward. — VERNON C. BRINK, Assistant Professor, Department of Agronomy, The University of British Columbia. LAWRENCE FARSTAD, Dominion Soil Surveyor, The University of British Columbia.

Snake's Method of Sloughing its Skin. — It is well known that every snake from time to time sloughs its old skin; and that in the process the skin is turned completely inside out. Just how is this effected?

In the "Field Book of Snakes of the United States and Canada" (p. 56), it is stated that "The old layer of skin first begins to loosen about the head, and by rubbing its head against stones, shrubbery or other objects, the snake works the skin back, turning it inside out as it goes. By a combination of wave-like muscular contractions and by rubbing its body against surrounding objects, the snake gradually strips the skin back over its body, turning it inside out as it peels off."

The exact method of sloughing, however, as seen by us on the only occasion of our witnessing it, differs in some respects from the above.

[1] Moss, E. H. 1932 "The Vegetation of Alberta. IV. The poplar association and related vegetation in central Alberta." Journ. Ecol. 20 : 380—415.

[2] Raup, H. M. 1941 "Botanical Problems in Borsal America. II" Bot. Rev. 7 : 204—248.

[3] Cowan, I. M. 1941 "Fossil and Subfossil Mammals from the Quarternary of British Columbia." Trans. Roy. Soc. of Can. 35 : Section IV : 39—50.

On July 3, 1930, one of our young people called me to see a snake that was in the act of sloughing its skin.

This was a handsome specimen of the Puget Sound Garter Snake *(Thamnophis ordinoides ordinoides)*, about two feet long, with a bright red dorsal stripe, and white lateral stripes.

The place where it lay was a sunny, south-facing grass bank at the edge of a lawn; and consisted wholly of short, fine turf, without stones or other obstructions. The spot was evidently favoured for sloughing purposes; for on the following day two snakes and a large lizard were seen there, and several discarded skins were found there that summer.

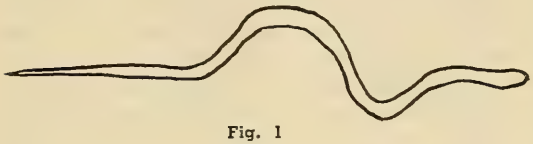


Fig. 1

The snake was lying with the fore part of the body strongly bent in a double curve, and the rest of the body straight, (fig. 1). When we first saw it, the process was already well under way.

The doubly curved forepart of the body (probably with the long ventral plates raised to hold the ground by their edges, thus giving a better grip) provided strong and steady anchorage.

It seemed to me, on stooping down to get a close view, that the body looked tense.

Our elder daughter, who watched part of the process while the snake was actually working to free itself, noted that the front, curved part of the body remained still; the next intermediate part was wriggling slowly forwards; and the part still enclosed in the old skin (i.e., the tail) was quiescent (fig. 2).

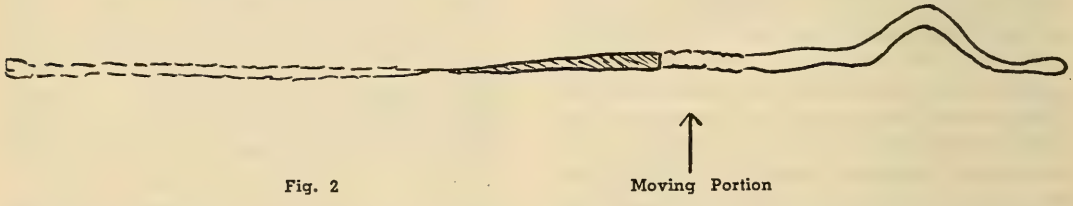


Fig. 2

At intervals, the middle portion of the body wriggled slowly forward, extricating itself, as it went, about an inch and a half at a time, from the old skin; and the snake then rested for a while.

Though stooping down within a foot or two of it, and watching closely, I could not see how the snake managed to extrovert the skin, while moving forward out of it.

The old skin seemed to turn back automatically, in the same way in which the fingers of a close-fitting kid glove tend to turn inside out, when the hand is being withdrawn from it after the glove has been turned back at the wrist.

It may be that this is explanation enough, since the tail holds the still unsloughed part of the skin taut. But since we know that the scales are erectile, each having its own individual muscle attached to it, I conjecture that, as the snake moves forward, the scales in contact with the portion of skin to be next sloughed may be lifted, their points engaging the old skin; and as the body moves slowly out, these raised scales may assist in turning the skin slowly inside out.

Thus three operations may perhaps take place simultaneously, the front part of the body, and probably also the tail end, gripping the ground firmly; while the intermediate part wiggles slowly forwards, and at the same time the scales on the following inch or so, engaging that part of the old skin, help to turn it outwards and backwards, — that is to say, inside out.

At the end of the whole process, which was slow, and apparently laborious, the snake and its sloughed skin lay stretched out straight, with their tail-tips touching, and the heads pointing in opposite directions.

In order to check this theory of the raised scales, I experimented, with my hand with-drawn just inside the cuff of a knitted woolen sleeve, the scales being represented by my curved finger-tips. Although these were clumsy instruments, and could be applied only to less than half the cuff circle at a time, thus losing much of their effectiveness the inside-out movement seemed indicated; and if it were possible to use a complete circle of finger-tips inside the cuff, the extroverting action might perhaps be roughly duplicated. — Mrs. T. L. THACKER, Hope, B.C.

Unusual Plumage Condition of Blue Jay (Cyanocitta cristata). — At my banding station, in Hudson Heights, P.Q., on Dec. 2, 1944, I banded #39-315657 of this species. The following notes were made: "large bird, beautifully marked plumage, blue areas rather pale. Outermost rectrix on each side without any black barring. The bill is notched near tip of upper mandible (maxillary tomium)".

On February 1, 1946, this bird recorded its first "return". The only notes of interest made on that date were "Flight feathers, especially tertials, very bright; weight 4 oz. The bill is now only slightly notched near tip of upper mandible and there are a few indentations further towards gape along edge of the maxillary tomium."

On Aug. 31, 1946, the second "return" was recorded. This bird's plumage was then in a very peculiar condition and the following notes were made: "practically no feathers on poll, face or neck which are covered with short stiff bristles. The outermost and next from outermost rectrices are very short, the white tips just emerging from quills. The wings are bright but alula feathers are just emerging from quills. There is a bare patch on the middle of lower part of breast but no thickening of the exposed skin observable. The blue of the back is pale, the upper tail coverts very short. The ear orifices are clearly visible on the bare auricular areas. The skin, usually covered by axillars is bare, the under wing coverts "ragged" with black tips emerging from quills. The upper mandible is notched as described on date of 1st "return" but the inner indentation is not as pronounced as at that time.

On Dec. 18, 1946, this bird registered its third "return" when nothing abnormal was noted about its plumage and following were noted, "Distal 5 secondaries very worn along outer edges the remaining proximals and tertials showing no wear and being lighter blue. Alulas and greater primary wing coverts are all barred with black, the greater secondary wing coverts are all broadly white tipped. All rectrices are barred with black, the outermost and next inward (each side) have each only one bar near the tip. Bill still decidedly notched near tip of upper mandible."

On April 4, 1947, the blue jay returned for the fourth time. Its plumage at that time was in good bright condition.

On December 31, 1947, the bird was retaken in one of my traps on its fifth "return". Though there were some minor differences in the plumage when compared with notes made on the fourth "return", particularly the barring of rectrices which is now distinct on all the feathers including the outermost, I noted nothing otherwise abnormal or remarkable. The only notching of the bill is now a slight depression on the maxillary tomium about 1/16" from tip of bill.

Thus between Feb. 1, 1946 and Aug. 31, 1946, the jay came to have defective plumage, not attributable to any normal moult, and by Dec. 18, 1946, a normal plumage had been regained. Was this defective plumage due to disease, faulty feather growth or other causes? — G. G. OMMANNEY, Hudson Heights, Que.

ON THE DISTRIBUTION OF THE GOLDEN EAGLE IN EASTERN CANADA: — After two centuries ornithologists are not able to expand much on the simple statement of George Edwards[1], that the "White-tailed Eagle (Golden Eagle, *Aquila chrysaetos canadensis)* is a native of Hudson's Bay, in the northern part of America...". A search of ornithological literature pertaining to eastern Canada shows a gradual accumulation of evidence on the breeding of this species in this part of the continent, but it does not disclose proof in the form of specimens collected. However, complete documentation on summer occurrence and reported nesting (historic and recent, recorded and unrecorded, definite and vague) leaves no doubt that the Golden Eagle is a native of this region and leaves one with the impression that it is impossible to have knowledge of the current status of such a species over such a vast and largely uninhabited area. A review of evidence, presented geographically, is as follows:

Beginning at the western edge of the eastern Arctic, a significant report comes from Mr. L. A. Learmonth, a Hudson's Bay Company Factor with long experience in the Arctic, and a person who has made careful observations on birds and collected scientific specimens. Mr. Learmonth has informed me that the Golden Eagle is of rare but regular occurrence at Repulse Bay (at the northwest of Hudson Bay, at the base of Melville Peninsula). He states further that he examined a skin of a Golden Eagle shot by a native at

[1] A Natural History of Birds. Vol. 1, 1743, p. 1.
[2] Notes on Birds Observed Along the West Coast of Hudson Bay. Condor, 33 : 157.

Repulse Bay in August, 1929. The report of regularity and the mention of a specimen taken in summer ties in with other high boreal records for spring, summer, and fall. Sutton[2] has recorded an apparent female, which he examined, that was shot a short way inland from Eskimo Point (middle west coast of Hudson Bay) during the fall of 1929. This specimen is now in the National Museum of Canada[3]. He has also recorded a Golden Eagle observed on May 23, 1931 not far south of Churchill, Manitoba, and the probable observation on two eagles on Coats Island[4] (in Hudson Bay) during the late summer or fall, probably in 1923.

Concerning more easterly portions of the Canadian Sub-Arctic, we have the statements of several authors that the Golden Eagle nests at the "Forks" in Ungava. Reference to Low[5] shows this situation to be the juncture of the Larch and Kaniapiskau Rivers, which form the Koksoak, about eighty miles south of Ungava Bay. This nesting site was apparently first recorded by Turner[6] in 1885. Packard[7] repeated Turner's record precisely and Macoun[8] repeated it in part but added the observations of Spreadborough who, travelling with Low, saw what he took to be a Golden Eagle at the Forks, the date being approximately mid-August, 1896. Spreadborough also saw the skin of a Golden Eagle which had been killed on the Koksoak River near Fort Chimo in late August or early September (the time estimated from Low's itinerary[5]). Though these Ungava reports are for a period more than fifty years ago, descriptions of the country and the geographic location persuades one to suspect that the species may still be established there.

An early Labrador observation was sketchily recorded by Low[9] who states that the Golden Eagle breeds at the head of Lake Michikamau and that the species was observed in several places along the upper Hamilton River (in 1894). It seems plausible that this remote region may still harbour the species.

Pertaining to a middle belt through eastern Canada and starting in the interior, we have the records of Preble[10]. He found the Golden Eagle at Hell Gate Gorge on the Nelson River (northeastern Manitoba) on June 28, 1900. Several birds were seen and at least two nests were noted on the cliffs. Here again one can see no reason why the species would not persist in this locality.

A more recent report comes from an area a considerable distance to the south but approximately on the same longitude. Mr. Douglas Mair, a Scotsman living near Emo, Ontario, related to the writer that during the late spring of 1927, he observed an occupied nest of the Golden Eagle on a seventy-five foot cliff on Pipestone Lake, approximately thirty miles north of Emo, Rainy River District, Ontario. Mr. Mair knew the species in Scotland and had collected its eggs there. Here again we have good circumstantial evidence and documentation but lack positive proof. It is known that the species is a regular and not infrequent winter resident of extreme western and northwestern sections of the Province. It is frequently taken by trappers, particularly in wolf sets.

A recent report from the northeastern section of Ontario has been recorded by Snyder[11]. Proof of late spring occurrence and documentary evidence of breeding was given for the area inland from Cape Henrietta Maria on Hudson and James Bays. To this can be added that Messrs. T. M. Shortt and C. E. Hope, R.O. M. Z., observed a Golden Eagle at Cockispenny Point (between Moosonee and Fort Albany) on June 5, 1942.

In the Lake Superior region there is the historic nesting station recorded by Raine[12]. The Golden Eagle was stated to nest on Thunder Cape near Port Arthur on Thunder Bay, in and prior to, 1891. This site is no longer used. The most recent summer occurrence reported from this general region is that of Baillie and Hope[13]. They observed a Golden Eagle on June 20, 1936, at Peninsula, Ontario.

The evidence indicates that at one time, fifty to one hundred years ago, the Golden Eagle occupied certain rugged escarpments

[3] The Birds of Churchill, Manitoba. Annals Carnegie Mus. 23 : 27.
[4] The Birds of Southampton Island. Mem. Carnegie Mus. Vol. XII, Pt. II. Section 2, pp. 81-82.
[5] Report on a Traverse of the Northern Part of the Labrador Peninsula from Richmond Gulf to Ungava Bay. Annual Rep., Geol. Sur. Can., 9 : 21L.
[6] List of the Birds of Labrador, including Ungava, East Main, Moose and Gulf Districts of the Hudson Bay Company, together with the Island of Anticosti. Proc. U.S. Nat. Mus., 8 : 244.
[7] The Labrador Coast. 1891, p. 425.
[8] Catalogue of Canadian Birds. Geol. Sur. Can., 1903. No. 822, p. 243.
[9] Report on Explorations in the Labrador Peninsula Along the East Main, Koksoak, Hamilton, Manicuagan and Portions of Other Rivers. Geol. Sur. Can., 8 : 7L and 325L.
[10] A Biological Investigation of the Hudson Bay Region. N. Am. Fauna, No. 22, p. 107.
[11] Golden Eagle Reported Nesting in Ontario. Auk, 57:565-566.
[12] Bird Nesting in North-west Canada. 1892, p. 12.
[13] The Summer Birds of the Northeast Shore of Lake Superior. Cont. Roy. Ont. Mus. Zool., No. 23, p. 7.

in the eastern counties of southern Ontario. Vennor[14] recorded a once-frequented nesting site (abandoned about 1837) on the Hastings Road, in the proximity of the York branch of the Madawaska River, in Hastings County. Another nesting site mentioned by him was situated some miles to the eastward, in a wall of rock rising from the waters of Mazinaw Lake in Barrie Township, Frontenac County. The most recent evidence of summer occurrence of the Golden Eagle for this section of the Province has been found in the Journal (in R. O. M. Z.) of the late J. H. Fleming. He states that a specimen, shot on July 30, 1905 at Lake Massanoga, Bon Echo P. O., Frontenac County, Ontario, was examined by him.

Eastward, in the Province of Quebec, we have the statement of Vennor[14] that Wm. Couper records from personal observation, (Couper original not found) the occurrence of the Golden Eagle on the south coast of Labrador (north shore, Canadian Labrador) in June, and remarks that it probably breeds there. For this general region we also have the early (1882) list of Merriam[15] which states that the species breeds in the vicinity of Point de Monts. Comeau[16] repeats this record and adds photographs of specimens shot on May 7, 1895. All these records lack definite breeding evidence and refer to a period fifty or more years ago.

Lewis[17] has referred to the record of Schmitt (original not available to the writer) which states that the Golden Eagle once (1904) was a resident on the Island of Anticosti, in the Gulf of St. Lawrence, adding that a nest was found on a cliff, beside the Jupiter River, in the interior. Reference to the more recent list of Braund and McCullagh[18] (1940) gives no evidence that the species still persists on Anticosti.

Finally, concerning Nova Scotia, we have the historic record of Gilpin[19] which states that the Golden Eagle was resident (1882) of that Province throughout the year. Dwight[20] recorded that he saw a live specimen in young plumage, captured June 23 (1892) near New London, Prince Edward Island, but after visiting the locality where the bird was trapped, doubted that it was bred in that locality. He suspected its source to be a wilder region such as Cape Breton to east, in Nova Scotia. Bent[21] mentioned Colchester Island[22] in Nova Scotia as a breeding station but gave no particulars.

To summarize, documentation on the summer occurrence and breeding of the Golden Eagle, from the Arctic northwest coast of Hudson Bay, northeastern Manitoba, and western Ontario, east to northern Ungava, Newfoundland, Labrador and Nova Scotia, covers a period of more than two hundred years. Many of the stations reported, which now fall within or on the border of settlement, are now abandoned. The total of evidence, with due consideration to the vastness of the area and the remoteness of many stations, strengthens the probability that migrant Golden Eagles observed in the settled south (late October to early December), emanate from existing breeding stations in the northeastern part of the continent. L. L. SNYDER, Royal Ontario Museum of Zology, Toronto, Ont.

[14] Our Birds of Prey, or the Eagles, Hawks, and Owls of Canada. 1876. p. 76 and p. 77.

[15] List of Birds ascertained to occur within ten miles from Point de Monts, Province of Quebec, Canada; based chiefly upon the notes of Napoleon A. Comeau. Bull. Nutt. Orn. Club, 7:238.

[16] Life and Sport on the North Shore of the Lower St. Lawrence and Gulf. Quebec, 1909. p. 424 and opposite p. 312.

[17] List of Birds Recorded from the Island of Anticosti; Quebec. Can. Field-Nat., 38: 89.

[18] The Birds of Anticosti Island, Quebec. Wilson Bull., 52:105.

[19] The Birds of Prey of Nova Scotia. Can. Sports. and Nat. 2:153.

[20] Summer Birds of Prince Edward Island, Auk, 10: 8-9.

[21] Life Histories of North American Birds of Prey. U.S. Natl. Mus. Bull. No. 167, p. 313.

[22] It has not been possible to locate an island of this name as cited by the original author (Bent, A. C., Bull. U.S. Nat. Mus. No. 167, p. 313).

An Indian Ice-pick from the Ottawa District. — As at many other places in Canada the environs of Ottawa have preserved to us evidence of the presence of aborigines now represented by Indians mostly remaining in Reservations. Artifacts are frequently collected although less commonly now than formerly. The neighbourhood of White's Bridge below Hogs Back on the Rideau River, is said to be one such collecting ground at which, personally, the writer has found nothing more impressive than a few flakes of chert apparently from the Indians' workings. At Fairy Lake on the rocky slopes of the Wrightville side are solid nodules of chert still imbedded in the rock strata, such as might have been a source of arrow-point material.

This note is more directly concerned, however, with another find within the Ottawa district. In July, 1946, on the closing day of Woodland Boys' Camp at their new site above Luskville, Que., and across the Ottawa

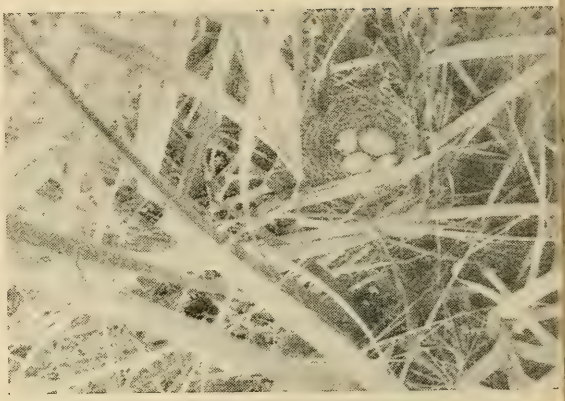
River from Constance Bay, a strange specimen was left at the camp museum by someone still, after careful enquiry, unidentified. The object failed to answer to the description of any present-day utensil and was finally submitted to Dr. Douglas Leechman of the National Museum who recognized it as an "ice-pick".

Fashioned out of grey slate the specimen is shaped like a spindle tapering gently to each end of its 10-inch length, and at no point more than a scant inch in diameter. One side is flattened and the other rounded to about an equal diameter across. Throughout it is smoothed to a dull polish. One end appears to have been worn a little, perhaps by use. The nearest approach among the white man's tools is a type of whetstone formerly used by reapers to sharpen the blade of a scythe or cradle.

The use made of these ice-picks is still a matter of speculation. They could have been, as some have supposed, for punching a hole through winter ice, either held in the hand vertically or, as shown in one illustration, bound with thongs across the end of a handle to form an implement like the workman's pick with which we are familiar. In the illustration referred to (Reproduced from Samuel de Champlain, edited by H. P. Biggar, Vol. 3, p. 135. The Champlain Society, Toronto, 1929) it is shown in the hands of a warrior as though it were a weapon. The indication of wear at one end might seem to favour rather its use as a tool for concussion. Quite obviously there is room here for more research for which each addition to the few specimens available is valuable.

The present acquisition, lacking any ascertained owner, has been deposited with the National Museum where it can best serve science. Being in an excellent state of preservation it is better not any longer exposed to the hazards of breakage in amateur hands. For the technical information here presented the writer is gratefully indebted to Dr. Douglas Leechman. — HERBERT GROH, Ottawa, Ont.

SORA'S EGG IN RED-WING'S NEST. — During a trip near Abord a Plouffe, P.Q., (on the southern shore of Ile Jesus) on June 17, 1947, a red-winged blackbird's nest was found with three eggs of the blackbird *(Agelaius phoeniceus)* and one of a sora rail *(Porana carolina)*. It was situated in a clump of marsh vegetation — the main vegetation



Nest of Red-winged Blackbird containing egg of the Sora Rail.

over an area of roughly 200 yards by 60 yards, being used by a loose colony of red-wings. It was about a hundred yards from a sora's nest with sixteen eggs in a small cat-tail marsh.

The nest was a typical red-wing's nest in such a situation — its floor being less than a foot above water. Besides the eggs in the nest, there was an egg of each species lying in the water on last year's vegetation at opposite sides of the nest directly beneath its edge. None of the marsh vegetation in the vicinity was trampled previous to my trip.

I was unable to revisit the area until June 21, when only a brief trip was possible. While looking for the nest, a companion, Miss Madeleine Furness, came across a bittern's nest with four young, three to five days old. Because of time taken to photograph this new discovery the red-wing's nest had to be left for another day.

On a final trip, June 28, the nest was found but there were only two young red-wings left; both were able to fly some distance. On this trip it was discovered that the bittern's nest was only nine feet from the much-sought nest. Also, another pair of soras was heard in an entirely different marsh separated from this one by a 150-yard stretch of dry land. — BERNARD GOLLOP, Verdun, Que.

Clay-colored Sparrow at Bayfield, Ontario. — In the early afternoon of July 14, 1945, as I stopped my car just north of the business part of Bayfield, Ontario, I heard a bird song which was new to me. The bird was apparently about a half a block away but travellnig in my direction. In a few minutes it came to a hedge about fifty feet from the parked

car, where I was able to observe it through field glasses. Although I had never observed one before I was certain with the aid of a bird book which I had with me that it was a Clay-colored Sparrow, *Spizella pallida*. It hopped in and out of the hedge frequently giving its characteristic three syllabled buzzing song. Upon recounting my observations to Mr. A. A. Wood of Chatham, who is acquainted with the species, he gave me assurance that my identification was correct. — C. HAROLD ZAVITZ, Chatham, Ontario.

On June 1, 1947, I found the second nest. This was on Shingle Creek, near Penticton. The female was seen sitting on a rock in midstream and while walking up the creek to observe her we found the nest. She had covered the eggs completely with down before leaving and only sharp eyes located it. The nest was placed in a newly cut bank where an overhang was formed by some tree roots. The seven eggs, which were far advanced in incubation, are now in my collection. — ERIC M. TAIT, Summerland, B.C.

Nest of Pacific Harlequin Duck.

Nesting of the Pacific Harlequin Duck in Vicinity of Penticton, B.C. — It is well known that the Pacific harlequin duck *(Histrionicus histrionicus pacificus)* is a frequent nester on some creeks in the South Okanagan Valley, but to my knowledge the two nests described in this article are the only ones to have been found and examined by an ornithologist.

The first was found in 1936 by a friend of mine on Sheep Creek, 6 miles southwest of Penticton, B.C. I examined it on May 24. It was placed in a clump of bushes at the foot of a small fir tree, about two feet from the creek bank, in rather an open location. The female left the nest when the branches of the bush were parted, exposing seven eggs. They appeared at this date to be in incubation, probably within a few days of hatching.

Porcupine Extracts Quill. — On April 27, 1948, while studying the breeding habits of the Eastern Canada porcupine *(Erethizon dorsatum dorsatum)* in Nova Scotia I live-trapped a large pregnant female. Upon release it was noticed that a quill had lodged in the ventral region. It was decided, therefore, to observe the animal to determine whether she would make any attempt to remove the quill. Following release she climbed a small white spruce *(Picea glauca)* and clung to the trunk. After resting for several minutes she released her fore paws, reached down with one of them, extracted the offending quill and holding it at "arm's length" she dropped it to the ground. Evidently such an operation was not new to her judging from the ease with which she extracted this quill. — AUSTIN W. CAMERON, Port Hood, N.S.

Notes on the Flora of Kings County, Nova Scotia. — Cambridge is situated in the middle of the Annapolis Valley fruit-growing belt, but, since "...orchards on the Cornwallis soils have (invariably) proved to be unprofitable..."[1] few large orchards exist here. The Cornwallis soils may be defined as upland, sandy, well-drained soils consisting of a comparatively thin layer of soil on water-laid parent material. The presence of the Cornwallis River, however, gives rich meadows, and in these (and in those of its tributaries) are numerous rich thickets bordering each edge of the river (or brook) and the steep side of the terrace leading down to it.

A great deal of the Cornwallis is banked on one or both sides by forest, primarily young growth, and the edges of this forest are composed of *Corylus cornuta, Crataegus* spp. (mainly *C. macrosperma* var. *acutiloba), Alnus rugosa* var. *americana, Sambucus canadensis, Viburnum cassinoides, Lonicera canadensis, Viburnum trilobum, Amelanchier laevis, Acer spicatum, Acer pensylvanicum* (occasionally), *Salix* spp. *Prunus virginiana, Prunus pensylvanica, Pyrus Malus,* young trees of *Ulmus americana, Quercus borealis, Populus grandidentata, Fagus grandifolia, Acer saccharophorum* (rarely), *Acer rubrum,* etc. Twining through these bushes is often found a heavy growth of *Clematis virginiana* thus increasing the shade in these meadow-side thickets. It is in these bordering thickets and in thickets isolated in the meadow, that some of the most interesting plants of the flora of the county are found.

The following is a list of the most notable plants as yet unreported from the Cornwallis River belt, some new to the county.

Allium tricoccum Ait. Roland reports this plant from "...rich sugar maple woods on the top of Blomidon, (Kings Co.) and in a rich intervale at Kemptown, Colchester Co."[2] It is found growing in great abundance on the hillside leading down to the brook formed by the mergence of the Brandywine and Lakeville brooks, Brooklyn Corner. There is a faint possibility of it being an introduction, but, according to the natives, who were unaware of its existence, there is no record of its introduction. Considering its abundance and extent one is also inclined to believe that this stand is nearly as old as that of Blomidon, some fifteen miles distant. The writer has known this location since 1936. Comparing this stand with that of Blomidon shows that the stands are of about equal extent, that of Blomidon being possibly a bit greater. Possibly further exploration of the Cornwallis River terraces between Lovatt Bridge and the Bird Sanctuary, Kentville, will lead to the discovery of more *A. tricoccum.*

Caulophyllum thalictroides (L.) Michx., known but from "...rich deciduous woods along the river intervale, Kemptown",[3] Colchester County, is found now to be growing in the same rich thicket as the *A. tricoccum* mentioned above from Brooklyn Corner and also, in greater abundance, in a thicket on the Cornwallis River, Cambridge.

Circaea quadrisulcata (Maxim.) French & Sav. var. *canadensis* (L.) Hara. This plant is found growing among thickets in large localized stands along the Cornwallis River in Cambridge, and also at the above-mentioned location in Brooklyn Corner.

Sanguinaria canadensis L., rare in Cambridge, in a rich thicket of *Crataegus macrosperma* var. *acutiloba* on the edge of the Cornwallis River... about six plants.

Sanicula gregaria Bickn., in Cambridge is found growing in abundance in thickets bordering the meadows of the river near the Indian reservation.

Nicandra physalodes (L.) Pers., was probably introduced as a garden plant, but now appears annually as a weed in Cambridge; rare, but the plants extremely large, some reaching the height of three feet with blossoms one inch in diameter. The only other location reported in the province, in Windsor, Hants County, according to its rediscoverer, J. S. Erskine, has now been eradicated. It was reported from Windsor by How in 1878[4]. There is a strong possibility that this plant is found elsewhere in the province.

Senecio aureus L., var. *intercursus* Fern., is found growing in abundance on the edge of a mucky thicket of the Cornwallis River, Cambridge.

Impatiens capensis Meerb., forma *citrina* (Weath.) Fern. & Schubert is found growing in profusion among the typical form in a wet

[1] Harlow, L. C. & G. B. Whiteside, **Soil Survey of the Annapolis Valley,** Dominion of Canada — Department of Agriculture Bulletin 752, 1943.
[2] Roland, A. E., **Flora of Nova Scotia,** Proceedings of the Nova Scotia Institute of Science XXI Part 3, 1944-1946.
[3] ——————— **Notes on the Flora of Nova Scotia** II, Rhodora 43 : 337-344, 1941.
[4] How, Henry, **Additions to the List of Nova Scotian Plants,** Transactions of N.S. Institute fo Science 4 : 312-319, 1878.

depression of Sharpe's Brook meadow, Cambridge. Forma *albiflora* (Rand & Redfield) Fern. & Schubert is found at the same location but is not as definitely established as forma *citrina,* being scattered sparingly through the rich beds of the typical form and f. *citrina.* Flowers of forma *citrina* are a rich yellow with red spots, those of forma *albiflora,* cream-coloured with reddish to pinkish spots.

Cypripedium acaule Ait., forma *albiflorum* Rand & Redfield is found wherever large numbers of the typical form grow. Plants are found that are definite albinos in that they have both with flowers and the sepals much paler (yellow rather than a reddish-brown) than those in the typical form. This form has been found in coniferous woods of Cambridge, Coldbrook and Brooklyn Corner.

Gnaphalium Macounii Greene reported three times from the province (Windsor, Hants Co., (Howe), North Mt., Granville, Annapolis Co., (Fernald), and Five-River Lake, Halifax Co., (Fernald),[5] is found growing sparingly scattered in a recently cultivated field, probably introduced in grain seed. — WILFRID SCHOFIELD, Acadia University, Wolfville, N. S.

[5] Fernald, M. L., A Model Flora of Nova Scotia, Rhodora 50: 211-215, 1948.

BOOK REVIEWS

Island Life: A Study of the Land Vertebrates of the Islands of Eastern Lake Michigan. *By Robert T. Hatt, Josselyn Van Tyne, Laurence C. Stuart, Clifford H. Pope, and Arnold P. Grobman; Cranbrook Institute of Science Bull. 27;* 8vo, pp. 1-1X, 1-179, *figs. 1-43, tables, 1-15, map. Price $4.00 (U.S.A.), cloth.* This attractive volume is the result of summer studies, made in the period 1937 to 1944, of the land vertebrates occurring on a group of islands in eastern Lake Michigan. These islands differ from one another greatly in area, ecological diversity, and in degree of isolation from the mainland, and these varying factors of course are reflected in the faunas of the respective islands. The book gives an account of the geological and cultural history of these islands and this is followed by detailed descriptions of the topography and ecology of each island. Well-annotated lists of the amphibians, reptiles, mammals, and birds give details of local distribution and much other information, and these lists are made more readily useful by an appendix in which the faunas are arranged by individual islands. Some extremely interesting adaptations to available habitat are recorded and there is a thought-provoking discussion of factors affecting the distribution of the animals concerned.

The book contains a great deal of information for those interested in zoogeography and ecology and is an admirable record of present conditions on the islands studied. It might well serve as an inspiration and model not only for future studies of changing conditions on the Lake Michigan islands themselves, but also for similar investigations by others in other parts of the world as well. — W. EARL GODFREY.

A Review of the Bird Fauna of British Columbia. *By J. A. Munro and I. McT. Cowan. British Columbia Provincial Museum, Special Publication No. 2; December, 1947; 285 pp., 42 figs.*

This admirable distributional list of the 491 species and subspecies of birds known to have occurred in British Columbia succeeds the 23-year-old list of Brooks and Swarth. A feature of the book is contained in the 42-page introduction of which 31 pages are devoted to descriptions of the thirteen biotic areas recognized by the authors in the extremely varied 355,855 square miles within the boundaries of the Province. In this difficult undertaking the field experience of the authors stands them in good stead. A glance at the map of these biotic divisions (Fig. 1) is enough to show the utter impossibility of accurately delimiting faunal distributions in terms of latitude alone in British Columbia. Also in the introduction is a useful account of the considerable environmental modifications that have occurred, particularly in the more settled areas of the Province.

For each species in the list there is a general statement of status. This is followed by definite dates and localities of records selected and arranged to show seasonal and geographic distribution and the duration of the migration and breeding seasons. Essential data on preserved specimens are frequently given and the present location of the specimen is indicated. Range maps show the distribution of the races of eighteen species.

Vernacular names are applied only to the species as a unit, the subspecies being listed by scientific names only. Species arrangement is that of the American Ornithologists' Union Check-list, 1931 edition (except that the eiders are transposed and the Hooded Merganser precedes the other mergansers). Nomenclature is usually that of the 1931 A.O.U. Check-list and the nineteenth and twentieth supplements except in cases where the researches of the authors or of others have indicated the wisdom of a departure. However, certain departures are difficult to understand. The Lesser Canada Goose and the Cackling Goose are treated as monotypic species, but no reasons for this are given.

In a work involving so much detail, minor oversights are almost inevitable. Thus we note the omission of the family name Ploceidae, leaving the English Sparrow erroneously under Parulidae. Typographical errors include the misspelling in conspicuous places of such words as Friedmann, jaeger, *inexspectata,* Golden Eagle, and *Egretta.*

Following the main list is an extralimital list of twenty species and a hypothetical list of fourteen. The extralimital list is designed to place accidentals and those species whose natural occurrence in the Province is doubted in a different perspective from those species that normally are part of the fauna. All species of which but one specimen has been collected in the Province are relegated to this list. One wonders if the usefulness of such an arrangement is not outweighed by certain disadvantages, however: (1) Such a list increases reference difficulties. Species contained in it are likely to be overlooked by one unfamiliar with the plan of the book. (2) Such an inflexible criterion would be far from infallible in some provinces and states and although it seems to have worked fairly well for British Columbia, yet one wonders if the Cape May Warbler which, paradoxically, the authors believe will be found to be of regular occurrence in the Peace River parklands (p. 239), or the Black-crowned Night Heron (p. 238), whose post-breeding-season wandering is normal, not abnormal, are correctly placed as accidentals. Corollarily, gregarious species of which more than one specimen are often as readily collected as a single specimen, might well hurdle the extralimital list prematurely. The application of the one specimen criterion would have been difficult, for instance, had one of the two recorded Washington specimens of *Tyrannus melancholicus occidentalis* flown the insignificant distance north to British Columbia. Parenthetically, this bird probably still must be regarded as accidental in Washington even though two specimens have been taken there. The hypothetical list is the place for species the natural occurrence of which is in doubt. The others, being definite occurrences, would seem to this reviewer best placed with the other definite occurrences for what they may be worth — and only time and future collecting can certainly decide that.

There is a useful bibliography in which 650 titles are cited. A few omissions are apparent, notably Tait's recording (Can. Field-Nat., Vol. 44, p. 90) of the first British Columbia specimen of the Black-crowned Night Heron and of an additional sight record of the same species. The titles are classified according to their subject matter into three sections (1) Systematics and Distribution; (2) Anatomy, Biology, Food Habits and Economics; and (3) Miscellaneous. Nos. 423, 525, 575, and probably others should have been placed in Section 1 rather than Section 2.

A work of such scope must be essentially a compilation and yet one is impressed by the vast amount of information that came from the note books of the authors, a tribute to their extensive field work in the Province. They seem to have adopted commendably cautious standards and to have applied them carefully and impartially to all data admitted to the book. These data add up to an unusual amount of very definite information, conveniently arranged and succinctly presented. Ornithologists at large will be grateful to the authors for making available such a useful book. — W. EARL GODFREY.

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The Canadian Field-Naturalist

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HIBERNATION OF BATS IN SOUTHEASTERN ONTARIO AND ADJACENT QUEBEC[1]

HAROLD B. HITCHCOCK

Middlebury College, Middlebury, Vermont.

IN AN ATTEMPT to discover the wintering place of eastern Canada's most common bat, *Myotis l. lucifugus,* the little brown bat, a banding project was started in the summer of 1939 in Middlesex and Kent counties, Ontario. In the course of the investigation 1,589 bats of this species were banded during the warmer months in these counties, and 254 elsewhere in Ontario and Quebec. One hundred and ninety-eight big brown bats, *Eptesicus f. fuscus,* the only other bat known to congregate in summer colonies in this region, were also banded. The search for hibernating bats has furnished information regarding the several species hibernating in southeastern Ontario and adjacent Quebec, as reported in earlier papers (Hitchcock, '40, '41, '45; Hitchcock and Reynolds, '40; Anderson, '40). Summer work also permitted investigations of the homing ability of the little brown bat (Hitchcock and Reynolds, '42), and of the big brown bat (Reynolds, '42). Observations on various aspects of hibernation not dealt with in previous papers are reported below.

Five species of bats are known to hibernate in the region: *Eptesicus f. fuscus* (Beauvois), the big brown bat; *Myotis keenii septentrionalis* (Trouessart), the Say bat; *Myotis l. lucifugus* (LeConte), the little brown bat; *Myotis subulatus leibii* (Audubon and Bachman), Leib masked bat or least bat; and *Pipistrellus subflavus obscurus* Miller, the pipistrelle. As Cross and Dymond ('29) and Anderson ('38 and '39) have pointed out, *Myotis sodalis* Miller and Allen, the cluster bat, may be added to the list eventually, as it is found south of this region, in the United States. These species hibernate in caves and abandoned mines where the temperature remains above freezing or even in some instances where the temperature drops a few degrees below freezing. *Eptesicus* alone is known from specimens to hibernate in buildings. Correspondents in Hastings County, Renfrew County, and Muskoka District, Ontario, where the temperature frequently drops to —20°F., have reported bats hibernating in hollow trees and beneath bark in midwinter, but no specimens were obtained for identification.

Locations exclusive of buildings where hibernating bats were found are listed in Table 1. Only four of these are of particular importance from the standpoint of numbers — the cave on the Fifth Concession, Tyendinaga Township, Hastings County, Ontario; the cave at Fourth Chute (Knightington), Renfrew County, Ontario; the cave about half-way between St. Pierre de Wakefield and Wilson Corners, Gatineau County, Quebec; and an abandoned corundum mine at Craigmont, Renfrew County, Ontario. Their locations are shown on the map, Fig. 1. The largest of these, near St. Pierre de Wakefield, is but a few hundred feet in extent, and the dimensions of all of them make it possible to reach almost every bat.

The Tyendinaga cave is in an open, level field at an elevation of 450 feet. Its entrance is a sinkhole about fifteen feet in diameter which on one visit in February was found entirely blocked by snow. At Fourth Chute the cave is in a limestone outcropping on the north bank of the Bonnechere River, at an elevation of 425 feet. Sinkholes and large openings to passages make this cave conspicuous. Most of the land immediately surrounding the cave area is open field or pasture, with wooded hills beyond. The part utilized by bats for hibernation lies farthest from the river, and is entered from one of the large, outside passageways through a narrow opening. The cave near St. Pierre de Wakefield is in hilly, forested country, at an estimated elevation of 700-1000 feet. Its

1. Received for publication December 22, 1947, revised 1948.

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TABLE 1

Composition of hibernating populations. With exceptions as noted these figures represent essentially the entire population discovered at each visit

Location Date	Eptesicus f. fuscus			M. keenii septentrionalis			M. l. lucifugus			M. subulatus leibii			Pipistrellus subflavus obscurus		
	♂	♀	Total	♂	♀	Total	♂	♀	Total	♂	♀	Total	♂	♀	Total
St. Pierre de Wakefield, Gatineau County, Quebec															
Nov. 25, 1939	21	2	23	14	3	17	4	1	5	—	—	—	—	—	—
Jan. 18, 1941	36	9	45	21	1	22	2	2	4	1	3	4	3	—	3
Apr. 4, 1942	—	2	2	5	1	6	57	26	83	—	—	—	2	—	2
Dec. 19, 1942	26	11	37	8	3	11	—	1	1	—	—	—	1	—	1
Mar. 15, 1945	27	7	34	1	—	1	27	5	32	—	—	—	—	—	—
Dec. 13, 1946	7*	1*	8*	*	*	*	*	*	*	*	*	*	*	*	*
Totals	117	32	149	49	8	57	90	35	125	1	3	4	6	—	6
Percentage	78.5	21.5		86.0	14.0		72.0	28.0		25.0	75.0		100	—	
Fourth Chute, Renfrew County, Ontario															
Apr. 5, 1942	27	7	34	7	3	10	—	—	—	18	12	30	6	—	6
Jan. 6, 1943	171	37	208	19	7	26	—	—	—	40	36	76	10	—	10
Feb. 26, 1944	143	38	181	21	7	28	1	1	2	71	71	142	16	2	18
Feb. 25, 1945	139	43	182	8	10	18	—	—	—	44	38	82	5	—	5
Jan. 20, 1946	70*	18*	38*	*	*	*	*	*	*	5*	4*	9*	*	*	*
Jan. 4, 1947	33	5	38	15	4	19	2	1	3	45	29	74	10	2	12
Nov. 29, 1947	17	3	20	14	2	16	—	—	—	16	5	21	7	1	8
Totals	600	151	751	84	33	117	3	2	5	239	195	434	54	5	59
Percentage	79.9	20.1		71.8	28.2		60.0	40.0		55.1	44.9		91.5	8.5	
Tyendinaga Twp., Hastings County, Ontario															
Jan. 17, 1941	1	1	2	—	—	—	52	12	64	1	1	2	10	—	10
Apr. 11, 1941	—	1	1	—	1	1	85	31	116	—	1	1	2	—	2
							(96)†	(33)†	(129)†				(3)†		(3)†
Apr. 3, 1942	—	—	—	—	—	—	115	37	152	—	1	1	8	—	8
Apr. 11, 1943	—	—	—	1	—	1	99	38	137	—	2	2	4	3	7
Feb. 28, 1945	1	7	8	—	—	—	25	11	36	—	—	—	1	—	1
Nov. 27, 1947	—	1	1	—	—	—	14	2	16	—	—	—	9	2	11
Totals	2	10	12	1	1	2	390	131	521	1	5	6	34	5	39
Percentage	16.7	83.3		50.0	50.0		74.9	25.1		16.7	83.3		87.2	12.8	
Craigmont, Renfrew County, Ontario															
Feb. 26, 1945	—	1‡	1‡	5‡	2‡	7‡	180‡	41‡	221‡	—	—	—	—	—	—
Nov. 28, 1947	—	1‡	1‡	44‡	11‡	55‡	612‡	199‡	811‡	—	—	—	—	—	—
Totals	—	2	2	49	13	62	792	240	1032	—	—	—	—	—	—
Percentage	0.0	100.0		79.0	21.0		76.7	23.2							
Rockwood, Wellington County, Ontario															
Feb. 25, 1940	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2
Mar. 16, 1941	—	—	—	—	—	—	—	—	—	—	—	—	3		3

TABLE 1 (Continued)

Location Date	Eptesicus f. fuscus			M. keenii septentrionalis			M. l. lucifugus			M. subulatus leibii			Pipistrellus subflavus obscurus		
	♂	♀	Total	♂	♀	Total	♂	♀	Total	♂	♀	Total	♂	♀	Total
Bronte, Halton County, Ontario															
Feb. 23, 1941	—	—	—	—	—	—	—	—	—	—	—	—	1	1	2
Feb. 28, 1942	—	—	—	—	—	—	—	—	—	—	—	—	2	—	2
Flowerpot Island, Bruce County, Ontario															
Oct. 28, 1939	—	—	—	—	—	—	2	—	2	—	—	—	—	—	—
Mar, Bruce County, Ontario															
Oct. 29, 1939	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—
Oxenden, Bruce County, Ontario															
Oct. 29, 1939	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—
Elora, Wellington County, Ontario															
Mar. 16, 1941	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—
Puzzle Lake, Lennox and Addington County, Ontario															
Apr. 12, 1941	—	1	1	1	1	2	—	—	—	—	—	—	6	—	6
St. Jacques, Montcalm County, Quebec															
Jan. 14, 1944	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
Grand total	720	196	916	186	56	242	1277	408	1685	241	203	444	108	12	120
Percentage	78.6	21.4		76.9	23.1		75.8	24.2		54.3	45.7		90.0	10.0	

* Complete census not made.

† Includes bats banded Jan. 17, 1941.

‡ Total population Nov. 28, 1947 estimated to be **M. l. lucifugus**, 3800; **M. keenii septentrionalis**, 230; **Eptesicus**, 5.

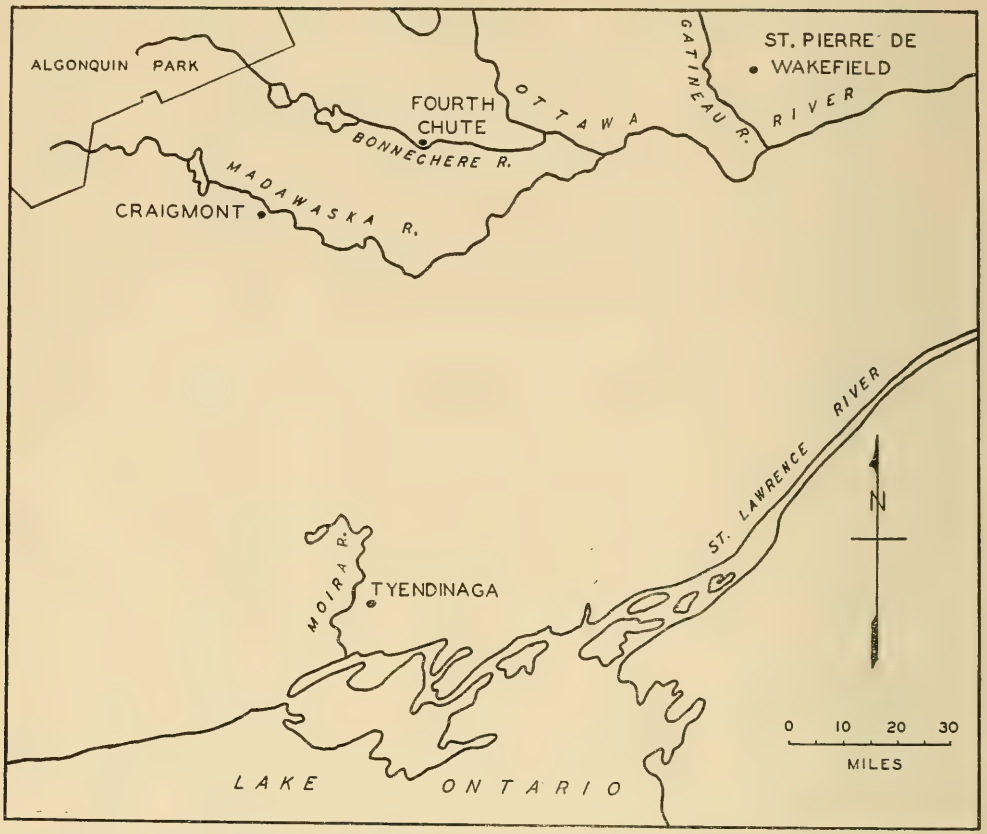

Fig. 1. Map of area in southeastern Ontario and adjacent Quebec showing the more important concentrations of hibernating bats.

mouth is large, and opens on the face of the steep bank of a small pond. Throughout the summer and early fall this cave is operated commercially. The corundum mine at Craigmont is a 465-foot tunnel driven into the side of a hill at an elevation of 1,000 feet. The mine has been abandoned since 1910 or 1911, according to Mr. V. L. Eardley-Wilmot of the Mineral Resources Division of the Bureau of Mines, Ottawa, who reported the presence of bats there to the National Museum of Canada in 1944.

These four retreats are not equally acceptable to the various species of bats present in the region. Although a few *M. subulatus leibii* have been found at Tyendinaga and St. Pierre de Wakefield, they are most numerous at Fourth Chute. In fact, larger numbers of this species have been found at Fourth Chute than in any other cave, the next largest known concentration of this bat being in Pennsylvania. The Craigmont mine contains several thousand *M. l. lucifugus,* the largest number yet discovered in the area, while only thirty-five miles distant, at Fourth Chute, this species has been found but infrequently. Conversely, Fourth Chute attracts large numbers of the big brown bat, while at Craigmont very few are found. *M. keenii septentrionalis,* though present at all four locations, is most numerous at Fourth Chute and Craigmont. Rarest of all in this area is the pipistrelle, though it has been found hibernating in small numbers in many different locations.

Because of the location of the caves, 300-400 miles from home, it was impossible to keep them under continuous observation. Although visits were made as early as November 25 and as late as April 11, most of the trips were in mid-winter, when the bat population is more stable and more likely to be at its maximum. No observations were made on the dates when the various species begin hibernation or leave their retreats in the spring. Visits on November 27 and 29, 1947, respec-

tively, to Tyendinaga and Fourth Chute showed far fewer bats than customarily encountered at these caves later in the season. At this particular time the ground was covered with snow, and at Fourth Chute the temperature registered 5°F. early in the morning of the visit. Apparently bats are able to find adequate shelter elsewhere until winter is well advanced. At Craigmont on November 28, 1947, the population appeared smaller than when observed in a previous February, though the large population made any accurate count impossible. Such aspects of hibernation have been studied more thoroughly by Folk ('40) in eastern New York, Mohr ('42) in Pennsylvania, Rysgaard ('42) in Minnesota, and Griffin ('40b) in New England.

Statistics on the composition of the hibernating populations by species and sex for each location are given in Table 1. Usually all bats within reach were handled and the great majority banded, but at Craigmont only a fraction were examined. On the November 28, 1947, visit bats were collected from measured distances in various parts of the tunnel. Using the figures thus obtained as a basis for calculations, it was estimated that the population of the mine on that date consisted of about 3800 *M. l. lucifugus,* 230 *M. keenii septentrionalis,* and 5 *Eptesicus.*

Table 2 gives the banding statistics for each location.

Environmental conditions vary considerably from one cave to another, as well as in different parts of a particular cave. At Fourth Chute the main passages are well ventilated by a through draft. Throughout most of the cave at St. Pierre de Wakefield there is good ventilation. The main passage at Tyendinaga and most of the tunnel at Craigmont likewise are well ventilated, though at neither of these places is there a through circulation of air. At Rockwood, where only pipistrelles were found, and in the side passage at Tyendinaga ventilation is not good. The outer part of the Craigmont tunnel and the main passage at Tyendinaga have dripping ceilings due to the condensation of water vapor. Bats hanging in these regions are covered with droplets of dew, and sometimes have water dripping from them. In the deeper parts there is less water, as shown by drier walls, and the bats themselves are dry.

Some measurements of relative humidity were made with a sling psychrometer. The

TABLE 2

Summary of bands used.

Locality	*Eptesicus f. fuscus*		*M. keenii septentrionalis*		*M. l. lucifugus*		*M. subulatus leibii*		*Pipistrellus subflavus obscurus*		Total
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	
St. Pierre de Wakefield, Quebec	64	22	40	7	87	31	—	—	2	—	253
Fourth Chute, Ontario	269	84	50	20	—	—	144	121	22	3	713
Tyendinaga Twp., Ontario	1	9	1	1	299	116	—	2	27	5	461
Craigmont, Ontario	—	—	16	4	655	149	—	—	—	—	824
Rockwood, Ontario	—	—	—	—	—	—	—	—	1	—	1
Bronte, Ontario	—	—	—	—	2	—	—	—	2	1	3
Flowerpot Island, Ontario	—	—	1	—	—	—	—	—	—	—	2
Mar, Ontario	—	—	1	—	—	—	—	—	—	—	1
Oxenden, Ontario	—	—	—	1	—	—	—	—	5	—	6
Puzzle Lake, Ontario	334	115	109	33	1043	296	144	123	59	9	2265

usefulness of this instrument is limited by its fragility and the requirement of a sufficiently large space to permit its rotation. At Fourth Chute it could not be used in several locations because of subfreezing temperatures. To overcome the limitations of this instrument a Serdex hygrometer employing a humidity-sensitive diaphragm was used on the final trip. This instrument is compactly housed, and operates in a stationary position, enabling one to make readings in confined spaces. A further advantage is that it is claimed by its makers to operate with an accuracy of 1.5% throughout its range of —35°F. to 130°F.

Relative humidity and temperature both increase as one proceeds into the interior of these caves. At Craigmont on November 28, 1947, the temperature 90 feet from the entrance was 36° F. and the relative humidity 85% while at the farthest end the readings were 42°F. and 96%. At Tyendinaga the readings on November 27, 1947, in the main passage, where *M. l. lucifugus* was collected, were 40°F. and 78% relative humidity; in the side passage they were 49°F. and 87%. At Fourth Chute on November 29, 1947, the temperature was 41°F. in the passage where most of the *M. keenii septentrionalis* were clinging to moist walls above a stream, and the relative humidity 90%. Surprisingly enough, the driest part of the cave, a secondary passage in which there was little moisture even on the floor, had the highest relative humidity, 92%.

Peculiarities in what appear to be requirements for successful hibernation in each of the species are discussed below.

Eptesicus is most tolerant to cold, dryness, and air movement. At St. Pierre de Wakefield this species occupies a restricted area in a large chamber near the entrance. The highest temperature there, on November 25, 1939, was 36°F., and the lowest, on December 19, 1942, was 32°F. Most of the bats cluster about the stump of a stalactite hanging from a somewhat raised part of the roof of a well ventilated chamber near the entrance.

At Fourth Chute the majority have usually been found packed into cracks at the outer parts of the cave, where the temperature on all mid-winter visits has been below freezing. On January 4, 1947, the air temperature next to the narrow, horizontal crack containing most of them was 23°F. and there was a strong draft from the outside, where the temperature that day was —30°F. On all but one of the midwinter visits to this cave the majority of this species were in a vertical crack about four inches wide in the ceiling of a narrow, drafty passage. Here, on February 26, 1944, 82 were crowded into a compact mass. On another visit the same crack contained two clusters, of 43 and 57 respectively. Although tightly packed and in a recessed location, they may find this spot too cold, as was noticed on January 4, 1947. On this date the crack held but 13, in two clusters, while most of the rest were discovered in a deep, narrow, horizontal crack over the entrance to another passage. It was necessary to use 12" forceps to collect these, and several escaped capture because beyond reach. On November 29, 1947, only a few specimens were found, and these not where they had been on previous visits, but in more exposed places in the outer parts of the cave. A few *Eptesicus* were always scattered singly throughout the warmer and moister parts of the cave, hanging exposed on the walls or from the ceiling. The single specimen from Elora was found in a shallow cave, several inches from an icicle, though a warmer region was available a few feet beyond. Toner ('35) collected 18 specimens from the frost-covered walls of tunnels under Fort Henry, near Kingston, Ontario, early in March, 1934. At Craigmont a few were found very near the entrance, covered with droplets of dew, and one at the farthest end of the tunnel.

The ability of *Eptesicus* to tolerate dryness is shown by the fact that it is the only species known from specimens to hibernate in buildings in this region. Seventeen were collected from buildings between the dates of November 29 and April 3, as shown in Table 3. Most of them were captured when rising temperature, brought about either by change in weather or the heating of the building, caused them to leave their hiding place.

Myotis keenii septentrionalis prefers cool, moist regions, and is usually found clinging to damp walls. Often they are bejeweled with dew. At Fourth Chute most of them hang separately from walls or ceiling, where they find protection from a strong draft by nestling between the bases of stalactites or between rockflows. Although ice forms on the floor beneath them, no evidence of freezing at their height has been observed. At Craigmont they were noted especially at the outer part of the tunnel, in dim light.

TABLE 3

Eptesicus hibernating in buildings

Date	Locality	♂	♀
Nov. 29, 1942	Glanworth, Middlesex County, Ontario	—	1
Jan. 5, 1942	Chesley, Bruce County, Ontario	1	—
Jan. 20, 1942	London, Middlesex County, Ontario	2	—
Jan. 20, 1943	" " " "	—	1
Jan. 20, 1943	Barrie, Simcoe County, Ontario	—	1
Jan. 22, 1941	Mt. Bridges, Middlesex County, Ontario	—	1
Feb. 3, 1941	London, Middlesex County, Ontario	1	—
Feb. 15, 1942	" " " "	1	—
Feb. 24, 1942	" " " "	—	1
Mar. 2, 1940	" " " "	—	1
Mar. 2, 1942	" " " "	1	—
Mar. 6, 1942	" " " "	—	1
Mar. 9. 1942	" " " "	—	1
Mar. 13, 1942	" " " "	—	1
Mar. 27, 1940	" " " "	—	1
Apr. 3, 1941	" " " "	1	—
	Total	7	10

Myotis l. lucifugus selects warm, draftless locations for hibernation. At Craigmont they are scattered fairly uniformly throughout all but the most exposed part of the tunnel. They occur singly and in clusters of various sizes up to as many as about 50 on the walls and roof, often packed into the irregular cavities in the rock. At Tyendinaga this species is found in two separate locations. In the main passage, where ice may form on the floor, they occupy small pockets in the ceiling, where they pack themselves in very snugly. In a much warmer, narrow, dead-end side passage, where ice never forms, they hang exposed, most of them in clusters, from the ceiling. At St. Pierre de Wakefield on April 4, 1942, a cluster of about 75 was found well within the cave, where the relative humidity was 90% and the temperature 37°F.

Myotis subulatus leibii resembles *Eptesicus* in its preference for cold, dry locations. In the drafty passage at Fourth Chute it usually hibernates in narrow cracks in the wall or roof, both singly and in company. From one small fissure 35 were extracted on January 4, 1947. They were packed so solidly that it appeared almost impossible for those farthest in to get air. It was a surprise to find this species, the smallest of the five, wintering in such cool places, though some warmth must come from the rocks where they wedge themselves in the draftier locations. Very few could be found on November 29, 1947, the earliest winter date on which this cave was visited.

Pipistrellus subflavus obscurus selects warm, draftless spots. It is content with small caves like those at Bronte, Rockwood, and St. Jacques, where it was the only species present, but it is also found in the larger caves. No clusters were observed, perhaps because of the scarcity in numbers. At Tyendinaga it is restricted to the narrow side passage, and at Fourth Chute most specimens have been collected in the smaller, dead-end passages. At Rockwood they were found in a very damp chamber where the air was rather foul.

Temperature, dryness of the walls, circulation of air, and relative humidity all seem to be important in the selection of a place for hibernation with these species. So far as was observed, males and females occupy the same areas and cluster together indiscriminately.

The suitability of a cave for hibernation may be affected by snowfall if the entrance is such that it can be blocked. At Tyendinaga, for example, the entrance was completely covered with snow on February 28, 1945. The blockade had apparently formed early in the winter, for the cave was appreciably warmer than on other visits and there was no ice on the floor. The caves at Fourth

Chute and St. Pierre de Wakefield both have entrances which always remain open, so that inside temperatures are liable to fluctuate with the outside temperature, especially at Fourth Chute, where there is a considerable draft. At Craigmont water draining from the tunnel freezes when it reaches the mouth of the mine, building up a dam of ice. On February 26, 1945, this dam was over a foot high. A barricade of icicles and columns from water seeping through the roof may effectively obstruct the tunnel opening. It took about ten minutes to chop a passage through this obstruction at the time of our February visit.

Molestation by man might destroy an otherwise acceptable place for hibernation. The cave at St. Pierre de Wakefield is commercialized, catering to sightseers until after the bats begin to arrive in the fall. Fortunately the proprietor, Mr. Zephir Lafleche, regards the bats as objects of natural interest, and protects them. Noise from a gasoline engine that operates the lighting system seems not to bother bats, as they congregate only a few feet from it. There was evidence of molestation by man in the spring of 1942, but the following winter the colony was again normal. At Craigmont many dead bats were seen on the floor. They had been killed by workmen washing down the walls with a hose in preparation for an anticipated resumption of mining. With these exceptions the bats seemed to have been undisturbed by man.

At Fourth Chute three partly eaten bats gave evidence of predation. A shrew, which is the predator suspected, would have little difficulty in reaching bats in this cave, but ice-covered passages leading to the region occupied by the bats would probably make such molestation infrequent.

At the four large colonies it was usual to find one or two bats in flight upon entering, before they could have been aroused by the intrusion. Such activity has been studied by Folk ('40) in New York, where most of the bats exhibit periodic activity throughout their stay within the cave. No evidence was noted that the bats feed while in the cave. Almost no insect life was observed, nor were bat feces seen on the floor except at Craigmont, where they were numerous in one spot well toward the rear of the tunnel. It is thought that these may have been deposited by bats which roosted there temporarily in the summer. Bats collected in caves late in the winter and dissected were found to have good stores of fat.

Reference should be made to the study by Rysgaard ('42) of *Eptesicus* and other cave bats in Minnesota, and to the study of *M. subulatus leibii* in Pennsylvania by Mohr ('36).

Rysgaard notes that *Eptesicus* avoids the warmer and more humid caves, and is found only in rather dry caves where temperature fluctuations are considerable. In this respect his observations and mine agree. He finds a tendency for females to hang singly and males to cluster together, which I have not noticed. He has also evidence that they feed during the winter. Another Minnesota report of apparent feeding is that of Swanson and Evans ('36), who noted in the cave an abundance of mosquitoes, moths, and hemipterans. At the caves I have studied the almost complete absence of food may account for failure to observe evidence of feeding, though the fact that what insects I have observed in the caves have not been flying around makes me doubt that they would be discovered by the bats. According to Rysgaard *Eptesicus* selects sites not exposed to drafts. Although in the draftier locations I have usually found them somewhat sheltered in cracks, they seem to prefer a spot where there is air movement. The most interesting exception I noticed was one *Eptesicus* at the far end of the tunnel at Craigmont. This spot was as dry as any in the mine, which suggests that the degree of dampness rather than air movement may have been the determining factor in the selection of this draftless location.

Mohr's observations on the hardy nature of *M. subulatus leibii* are in harmony with mine. These bats, he has observed, enter the caves about a month after the little brown bats, select exposed places within the caves, and apparently desert the caves during warm spells. He has found them in only a few of the many caves he has visited, the caves utilized being for the most part in the foothills of mountains rising to 2,000 feet, and covered with hemlock forest. It would seem from the large numbers at Fourth Chute that neither high mountains nor hemlock forests, both absent around Fourth Chute, are as important as the character of the cave itself in determining where this species will hibernate. The forests near Fourth Chute are mixed, with spruce and white cedar predominating among the conifers.

TABLE 4

Summary of local recoveries of banded bats at Fourth Chute, Tyendinaga, and St. Pierre de Wakefield. Under the heading "Number Banded" are enumerated only those banded prior to the date on which the last visit was made.

Species	Male			Female			Both Sexes
	Number Banded	Number Recovered	Percentage Recovered	Number Banded	Number Recovered	Percentage Recovered	Percentage Recovered
Eptesicus f. fuscus	316	184	58.2	109	40	36.7	52.7
M. keenii septentrionalis	78	4	5.1	26	1	3.8	4.8
M. l. lucifugus	463	68	14.7	159	16	10.1	13.5
M. subulatus leibii	133	40	30.1	119	24	20.2	25.4
Pipistrellus subflavus obscurus	34	3	8.8	6	0	0.0	7.5

Table 4 gives a summary of bats recaptured at the place of banding in subsequent winters. *Eptesicus* leads with a percentage of 52.7, followed by *M. subulatus leibii* with a percentage of 25.4. Actually the returns were much higher than these figures would indicate, when particular groups are considered rather than the sum of all groups. In Table 5 statistics are given for *Eptesicus, M. l. lucifugus* and *M. subulatus leibii,* showing the record of the group with the highest percentage of recoveries. It is to be noted that in each species the percentage recaptured is greater for males than for females, suggesting a higher mortality rate in females than in males. Returns for the other species were too few to warrant their inclusion in Table 5.

No attempt was made during banding to determine the age of the bat. In Table 6 data are given for each species showing the oldest so far as known from the dates of banding and recapture. One specimen of *Eptesicus* was recaptured during the ninth winter after banding, and three of *M. l. lucifugus* during the seventh winter. Although seven or eight years may represent an old age for such bats, it is not the maximum for *M. l. lucifugus,* as Griffin has recovered this species after thirteen years (personal correspondence).

Only two of the bats banded during hibernation have been recaptured during the summer months, so far as is known. Both of these were *Eptesicus.* A female banded at St. Pierre de Wakefield on March 15, 1945, was recovered at Aylmer, Quebec, sixteen miles south of the cave, on June 29, 1946. A male banded at Fourth Chute on January 6, 1943, was recovered at Hyndford, within a few miles of the cave, May 30, 1946. Three *Eptesicus* which were banded in the London region during summer months were subsequently recovered in buildings during the winter, all within five miles of their summer location.

The number of banded bats recaptured away from their place of hibernation has been disappointingly small. Some may have been found by persons who did not understand the significance of the band and failed to report their discovery to the Dominion Wildlife Service, Ottawa, or to the Fish and Wildlife Service, Washington, where complete records are kept. One such case came to light during the search for a cave near Nelson, Halton County, Ontario. A farmer there recalled that his cat had caught a banded bat in the spring of 1940. Although surprised that anyone was interested enough in bats to band them, he did not know about making a report, and the bat was consigned to the manure pile. Other bats may have been killed without the bands being noticed, as the earlier banding was done on the leg, where the band may not always be visible. More recently the bands have been placed on the arm, where they are always conspicuous, as recommended by Trapido and Crowe ('46).

Only in *M. subulatus leibii* are hibernating males and females approximately equal in numbers; in the other species males greatly outnumber the females, as shown in Table 7. Mohr ('45) has reported a similar situation, though less pronounced, for these species in Pennsylvania caves. Rysgaard ('42) and Griffin (40b) likewise report a preponderance of hibernating males in the regions they have studied. In Thunder Bay District,

TABLE 5

The best recovery records for three species

Location Date	Species	Male			Female			Both Sexes
		Number Banded	Number Recovered	Percentage Recovered	Number Banded	Number Recovered	Percentage Recovered	Percentage Recovered
Fourth Chute Apr. 5, 1942	Eptesicus f. fuscus	27	22	81.5	7	3	42.9	73.5
Tyendinaga Jan. 17, 1941	M. l. lucifugus	48	28	58.3	10	3	30.0	53.4
Fourth Chute Apr. 5, 1942	M. subulatus leibii	15	7	46.7	9	3	33.3	41.7

TABLE 6

Longevity as shown by local recoveries of banded bats

Species	Location	Date banded	Date Recovered	Number	Sex	Years
Eptesicus f. fuscus	St. Pierre de Wakefield	Nov. 25, 1939	Feb. 20, 1940*	1	♂	9
" " "	" " " "	Nov. 25, 1939	Feb. 7, 1948*	1	♂	8
M. keenii septentrionalis	Fourth Chute	Jan. 6, 1943	Nov. 29, 1947	1	♂	5
" " "	St. Pierre de Wakefield	Nov. 25, 1939	Dec. 19, 1942	1	♂	3
M. l. lucifugus	Tyendinaga Twp.	Jan. 17, 1941	Nov. 27, 1947	2	♂	7
" " "	" "	April 11, 1941	Nov. 27, 1947	1	♂	7
M. subulatus leibii	Fourth Chute	April 5, 1942	Jan. 4, 1947	1	♀	5
" " "	" "	Jan. 6, 1943	Nov. 29, 1947	1	♂	5
Pipistrellus subflavus obscurus	St. Pierre de Wakefield	April 4, 1942	Feb. 7, 1948*	1	♂	6
" " "	Tyendinaga Twp.	April 3, 1942	April 11, 1943	1	♂	1

* Reported by Mr. A. W. F. Banfield, Mammalogist, Dominion Wildlife Service. See Banfield ('48).

TABLE 7

Sex of hibernating bats. Banded bats counted only at time when first caught; recoveries are not included in this table.

Species	Numbers			Percentage	
	♂	♀	Total	♂	♀
Eptesicus f. fuscus	386	128	514	75.1	24.9
M. keenii septentrionalis	181	56	237	76.4	23.6
M. l. lucifugus	1187	389	1576	75.3	24.7
M. subulatus leibii	187	176	363	51.5	48.5
Pipistrellus subflavus obscurus	104	12	116	89.7	10.3

Ontario, Allin ('42) collected 99 males and 39 females of *M. l. lucifugus* from an estimated population of 1,500. Summer collecting of immature specimens at roosts indicates that for *M. l. lucifugus* and *Eptesicus* males and females are produced in approximately equal numbers. In these two species the females form maternity colonies where I have rarely found mature males. For example, of 431 adult little brown bats taken at such roosts there were but two males (Hitchcock, '40). Of 502 immature bats of this species collected at roosts during the months of July, August, and September, 1939-41, 154 were males and 348 females. Almost all of these were collected in traps placed outside the roosts, where only those old enough to fly were caught. The disproportionate number of females seems to result from the young males' deserting the roost as the summer advances, while the young females remain behind, as figures for the month of July only show a ratio of 32 males to 42 females. For juvenile specimens only. Cagle and Cockrum ('43), collecting the specimens within the roost, found 219 males to 213 females in a southern Illinois roost; Griffin ('40b) in New England found 450 males to 440 females. Dymond ('36), however, found 37 males and 20 females at a small colony at Lake Nipissing, Ontario. In *Eptesicus* 50 of a total of 91 immature specimens collected by me at summer roosts were males. No data are available for the other species.

The populations discovered hibernating in the region are remarkable in showing a greater abundance than had been suspected from summer records of the pipistrelle (two summer specimens) and *M. subulatus leibii* (one summer specimen). The 142 specimens of the latter, caught February 25, 1944, at Fourth Chute comprise, in fact, the largest group ever reported for the species. *Eptesicus* and *M. l. lucifugus*, on the other hand, occurred in less abundance than summer numbers would suggest. In the case of *Eptesicus* the ability to hibernate in buildings and probably also in hollow trees and behind bark may account for their relative scarcity in caves. The little brown bat, on the other hand, because of its preference for the most sheltered parts of caves, would appear to require greater protection than the big brown bat. Possibly rock fissures inaccessible to man, and other retreats as yet unnoticed, provide suitable shelter in the area.

Although hibernating species are not thought of as migratory, because found in the same region both summer and winter, those that occupy an area devoid of suitable shelter must perform at least a local migration, as pointed out earlier (Hitchcock, '40). Evidences of migration noted in this investigation are given below.

The cave at Tyendinaga was visited twice during one winter. Of 64 *M. l. lucifugus* banded on January 17, 1941, only 13 remained on April 11, 1942, but 116 new bats were found. Although the latter may have been overlooked on the first visit, this seems unlikely because of the small size of the cave and the thoroughness of the first search. On April 11, 1943, 102 bats were banded at Tyendinaga of which only two were retaken on the next visit, February 28, 1945. This is a much lower percentage than for other groups at this location, and suggests that these bats may have entered the cave late in the season in 1943 and had either not yet returned at the time of the 1945 visit, or, having returned, had been unable to enter because of snow which blocked the entrance. At St. Pierre de Wakefield only two sizeable groups of this species were discovered, on April 4, 1942, when there were 83, and March 15, 1945, when there were 32. Other visits earlier in the winter produced a maximum of five. This suggests that the two large groups had entered the cave in the spring after hibernating elsewhere during the winter months.

Positive evidence that *M. l. lucifugus* migrates, both to caves from summer roosts, and from one cave to another during the season of hibernation, has been given by Griffin ('40a and '45). Zimmerman ('37) reported hundreds of this species dead in the streets at Black River Falls, Wisconsin, on October 29, 1936, apparently during migration. Nearer at hand, Hammond ('48) reports a southward migration of several hundred small bats in Quebec, at the northern end of Lake Champlain on September 16, 1931. Unfortunately no specimens were collected, but because of their smal size they may have been some species of *Myotis*.

Whether the disproportionate number of males hibernating in the region can be explained by a greater tendency on the part of females to migrate elsewhere, or to some other factor, such as a greater mortality among females, remains to be determined by future investigations. It may be that the differences between Mohr's sex ratios for Pennsylvania and mine for Ontario and Quebec are significant. At any rate Mohr reports a somewhat greater proportion of females of *Eptesicus* and *M. l. lucifugus* in Pennsylvania than I have found in Ontario and Quebec.

I am greatly indebted to many individuals and divisions of the Dominion of Canada government for assistance of many kinds during the investigation. The National Museum of Canada co-operated in providing transportation in the Ottawa region. The Dominion Wildlife Service (formerly National Parks Bureau) of the Department of Mines and Resources, Ottawa, provided bands (issued by the Fish and Wildlife Service of the United States Department of the Interior) and volunteers from this office made several trips to the cave at St. Pierre de Wakefield when I was unable to reach that rather isolated spot myself. The Royal Ontario Museum of Zoology, Toronto, gave valuable assistance in locating caves. Dr. C. H. D. Clarke and Dr. Austin L. Rand both provided hospitality in Ottawa and assisted in the banding on several occasions. Special thanks are due to Mr. Zephir Lafleche of Hull, Quebec, for permission to study the bats at his cave and for transporting a party to it for that purpose; also to Mr. and Mrs. W. J. Tracy and their son at Fourth Chute for hospitality and assistance in banding operations. Without such aid from these and other individuals the data reported in this paper could never have been assembled. It is a pleasure to acknowledge financial aid from the American Academy of Arts and Sciences in connection with the 1947 trip.

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CHRISTMAS BIRD CENSUS — 1948 [1]

SEVERAL of the reports listed below are of counts made before the period specified by the National Audubon Society. These reports are included because it is believed that some of them were made without realization that the period was invalid. Contributors are advised to take note of the prescribed date limits in the future and not to rely on continued leniency. — Editor.

Windsor, Hants Co., N.S. (radially within 5 miles). — Dec. 28, 1948; 10 a.m. to 1 p.m. and 2.30 to 4 p.m.; temp. 20°F. at start; two to six inches of drifted snow; overcast; no wind; 2 observers in 1 party. Herring Gull, 5; Great Black-backed Gull, 4; Northern Raven, 1; Crow 37; Downy Woodpecker, 1; Black-capped Chickadee, 16; Golden-crowned Kinglet, 2; White-breasted Nuthatch, 1; Slate-colored Junco, 5; Starling, 65; English Sparrow, 60. Total 11 species, 230 individuals. — James C. Morrow, Robert S. Morrow.

Sackville, N.B. (area around West Sackville, Sackville, Jollicur Lakes and head of Cumberland Basin; coniferous forest 50%, salt marshes, salt water 30%, cultivated lands 20%). — Jan. 1, 1949; 8.00 a.m. to 4.30 p.m. Cloudy to partly clear; temp. 35 to 40°F.; calm; no snow on ground; lakes frozen over. Two observers in one party. Total hours, 17 (2 car, 15 foot); total miles 75 (40 by car 35 by foot). Black Duck, 34; American Mer-

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ganser, 1; Ring-necked Pheasant, 4; Great Black-backed Gull, 2; Herring Gull, 12; Hairy Woodpecker, 2; Downy Woodpecker, 2; Northern Raven, 15; American Crow, 14; Black-capped Chickadee, 42; Brown-capped Chickadee (Acadian), 16; Brown Creeper, 1; Golden-crowned Kinglet, 14; Starling 538 (500 est., 38); English Sparrow, 48; American Goldfinch, 1; White-winged Crossbill, 8; Slate-coloured Junco, 1; Swamp Sparrow, 1; Lapland Longspur, 4. Total, 20 species; 790 individuals. (Seen in area Dec. 22; Green-winged Teal, 25; Lapland Longspur, 79; Snow Bunting, 125.) — Joan and George Boyer.

Woodstock, N.B. (Golf Links, Paynter's Pasture, Meduxnekeag River as far as dam, woods along road to Kilmarnock Deadwater; coniferous forest 30%, mixed forest 40%, cultivated land and overgrown pasture 20%, river shore line 10%). — Dec. 26, 1948; 8.00 a.m. to 4.30 p.m.; overcast; temp. 10 to 20°F.; wind N.W. 1-7 m.p.h.; 2 inches of snow, some of fields bare; extensive patches of open water in rivers. Two observers in one party. Total hours 17 (on foot); total miles 30 (on foot). American Golden-eye, 15; American Merganser, 1; Goshawk, 1; Ring-necked Pheasant, 4; Blue Jay, 2; American Crow, 1; Black-capped Chickadee, 60; Brown-capped Chickadee (Acadian), 7; Red-breasted Nuthatch, 10; Brown Creeper, 2; Starling, 553 (500 est., 53); House Sparrow, 48; Redpoll, 8; White-winged Crossbill, 3; Slate-coloured Junco, 3. Total 15 species; about 718 individuals. — Joan and George Boyer.

Quebec, Que. (same area as in 1947, except Ste. Foy not covered; town suburbs 10%, fields 23%, coniferous forests 15%, deciduous woods 6%, mixed woodlands 39%, shores 7%). — Dec. 28, 1948; 7.15 a.m. to 4.20 p.m.; clear to cloudy; temp. 20-25°F.; wind S.W. 1-7 m.p.h.; 8 inches snow on ground; small rivers completely frozen moving ice on St. Lawrence R. Four observers in 3 parties. Total hours, 19 (on foot); total miles 19 (on foot). Ring-necked Pheasant, 2; Herring Gull, 1; Barred Owl, 1; Blue Jay, 1; American Crow, 40; Black-capped Chickadee, 36; Red-breasted Nuthatch, 1; Bohemian Waxwing, 1; Starling, 31; English Sparrow, 110; Evening Grosbeak, 71; Pine Grosbeak, 2; Redpoll, 128; White-winged Crossbill, 6. Total, 14 species; 431 individuals. (Seen in area Dec. 23: Slate-colored Junco, 1; Dec. 10: Rusty Blackbird, 1, probably a late migrant; also on Census day, 1 Saw-whet Owl found dead. — R.C.). — Louis-A. Lord, François Hamel, Henri Talbot, Raymond Cayouette. (La Société Zoologique de Québec.)

Montreal, Que. (Mount Royal, LaSalle Woods, Verdun, Crawford Park, Cote St. Paul Woods, St. Lambert, Montreal South, south shore of the St. Lawrence River from Caughnawaga to Jacques Cartier Bridge and north shore from Dorval to Victoria Bridge, Heron Island, Goat Island, Cartierville, Back River, Lachine Woods, Cote St. Luc Woods and Thorn Hill). — Dec. 19, 1948; variable cloudiness; wind NE, 2 to 5 m.p.h.; temp. 18 to 25°F.; depth of snow in open country, nil. 28 observers in 8 parties. Total hours, 52; total miles, 119 (43 on foot, 10 by boat, 66 by car). Common Loon, 1; Double-crested Cormorant, 2; Snow Goose, 1 (Anglin, Pollock, Ryan and Scott); Mallard, 20; Black Duck, 347 (partly estimated); Pintail, 250; Greater Scaup Duck, 34; American Golden-eye, 1398 (part. est.); White-winged Scoter, 8; Hooded Merganser, 12; American Merganser, 108; Red-breasted Merganser, 2; Sparrow Hawk, 2; Ruffed Grouse, 4; Ring-necked Pheasant, 125 (part. est.); Glaucous Gull, 1 (Scott); Great Black-backed Gull, 21; Herring Gull, 644 (part. est.); Rock Dove, 209 (part. est.); Screech Owl, 1; Great Horned Owl, 2; Long-eared Owl, 1 (Bunker); Flicker, 3; Hairy Woodpecker, 8; Downy Woodpecker, 27; Crow, 38; Black-capped Chickadee, 25; White-breasted Nuthatch, 16; Brown Creeper, 12; Robin, 13; Black Thrush *(Turdus infuscatus)*, 1 (seen by the Mount Royal party — Miss Bower, MacBride, Rolland and Mr. and Mrs. Terrill — and by others since the 19th; identified by uniform black plumage, bright orange-yellow bill, yellow eye-ring and yellow legs and feet, which agrees closely with Ridgeway's description under *T. planesticus infuscatus* from high altitudes of southern Mexico and Guatemala); Cedar Waxwing, 30; Northern Shrike, 3; Starling, 1026 (part. est.); English Sparrow, 594 (not fully est.); Red-winged Blackbird, 6; Evening Grosbeak, 2; American Goldfinch, 9; Tree Sparrow, 21; Song Sparrow, 6; Snow Bunting, 5. Total, 41 species, approx. 5538 individuals. Seen Dec. 26, Raven (Gollop and McLaren). — J. P. Anglin, Miss M. E. Bower, P. Boultbee, Mrs. P. Boultbee, H. A. Bunker, J. D. Cleghorn, J. A. Decarie, A. E. Fairbrother, Miss M. Furness, D. Garneau, J. B. Gollop, Miss G. E. Hibbard, A. R. Lepingwell, W. M. MacBride, I. McLaren, G. H. Montgomery, Mrs. G. H. Montgomery, W. Pollock, W. H. Rawlings,

Mrs. W. H. Rawlings, Miss M. Robinson, J. A. Rolland, D. Ryan, C. C. Sait, D. M. Scott, C. H. Sullivan, L. McI. Terrill, Mrs. L. McI. Terrill. (The Province of Quebec Society for the Protection of Birds.)

Hudson Heights, Que. (same area as referred to in 1947 count; coverage not as complete as in previous counts because of inconvenience of the dates specified). — Jan. 2, 1949; 8 a.m. to 4.30 p.m.; very dull after night of wet snow; temp. 23° to 30°F.; wind W. 3 m.p.h.; bar. 29.50; ground covered with 12 inches wet snow; branches of trees, twigs and bushes snow-coated obscuring visibility; running streams open; general visibility poor. Nineteen observers in 7 parties. Total hours, 32 (20½ on skis, 11½ on foot); total miles 43½ (30½ on skis, 13 on foot). Hairy Woodpecker, 1; Downy Woodpecker, 2; Blue Jay, 81; Crow, 3; Black-capped Chickadee, 106; White-breasted Nuthatch, 10; Red-breasted Nuthatch, 1; Brown Creeper, 1; Starling, 39; English Sparrow, 29; Redpoll, 75 (in 4 small flocks); Slate-coloured Junco, 3; Tree Sparrow, 2; Snow Bunting, 12. Total, 14 species, 365 individuals. (Seen in area Dec. 29, Evening Grosbeak, 10; Jan. 1, Ruffed Grouse, 2; Screech Owl, grey phase, 1). — Vi. Bryan, Amy Clarke, Ed. and Eunice Croll, Brian Heeney, Althea Macaulay, Dunbar and Violet Mullan, John and Mary Mullan, Cecil and Johnny Nelson, Geof. and Kate Ommanney, Betty Puxley, George and Drucilla (Sr. and Jr.) Riley, Ted. Watson, Mack. Yuile.

Ottawa, Ont. — January 2, 1949; 9 a.m. to 4.15 p.m.; cloudy; all trees covered with ice, poor visibility and travelling conditions, 12 in. snow; wind N.W. 5 m.p.h., temp. 22 degrees to 28 degrees; 21 observers in 8 parties; 51 miles on foot, 98 by car. American Golden-eye, 157; American Merganser, 73; Red-breasted Merganser, 12; Red-shouldered Hawk, 1; Sparrow Hawk, 1; Ruffed Grouse, 1; European Partridge, 5; Ring-necked Pheasant, 3; Herring Gull, 4; Rock Dove, 232; Hairy Woodpecker, 2; Downy Woodpecker, 9; Horned Lark, 1; Canada Jay, 1; Blue Jay, 6; American Crow, 6; Black-capped Chickadee, 51; White-breasted Nuthatch, 8; Red-breasted Nuthatch, 1; Brown Creeper, 6; Cedar Waxwing, 5; Northern Shrike, 1; Starling, 911; English Sparrow, 397; Evening Grosbeak, 20; Pine Grosbeak, 3; Tree Sparrow, 6; White-crowned Sparrow, 2; Snow Bunting, 87. Total, 29 species, 2012 individuals. — A. E. Bourguignon, A. Cameron, G. Cooch, B. A. Fauvel, Dr. and Mrs. C. E. Frankton, R. Frith, Dr. and Mrs. J. W. Groves, Miss V. Humphreys, H. Lloyd, L. MacKinnon, M. McDonald, E. Mills, Mrs. E. Nelson, C. Neville-Smith, Miss V. Ross, Dr. and Mrs. D. B. O. Savile, J. Smith, E. Thacker.

Pakenham, Lanark Co., Ont. — December 27, 1948; 7.30 a.m. to 4.30 p.m.; snow falling between 9 a.m. and 10.30 a.m., brisk east wind, temp. 20 to 25°F.; 6 in. snow; 6 observers in 4 parties; 21 miles on foot. Ring-necked Duck, 1; Sharp-shinned Hawk, 1; Ruffed Grouse, 1; Rock Dove, 6; Hairy Woodpecker, 1; Downy Woodpecker, 2; Blue Jay, 7; Crow, 1; Black-capped Chickadee, 36; White-breasted Nuthatch, 11; Starling, 42; English Sparrow, 70; Evening Grosbeak, 44. Total, 13 species, 223 individuals. Present during census period: Great Horned Owl, Pileated Woodpecker, Northern Shrike, Snow Bunting. — Edna G. Ross, Verna M. Ross, T. W. Ross, R. M. McKenzie, Bill McKenzie, Douglas Deugo.

Peterborough, Ont. — Jan. 8, 1949; 9 a.m. to 4.30 p.m.; cloudy then clear; wind 3-5 m. p.h.; temperature 34-44°F.; 8 inches of snow; 3 observers in 1 party; total miles 35 by car, 4 on foot. American Golden-eye, 7; American Merganser, 9; Herring Gull, 2; Hairy Woodpecker, 1; Downy Woodpecker, 3; Black-capped Chickadee, 32; White-breasted Nuthatch, 2; Starling, 10; English Sparrow, 40; American Goldfinch, 20; Tree Sparrow, 30. Total, 11 species, 156 individuals. J. L. McKeever, R. L. Hale, R. Fitzgerald.

Rutherglen, Ont. (15 miles E. of North Bay to 10 miles W. of Mattawa). — Dec. 31, 1948; black spruce bog, township of Bonfield, village of Bonfield, highway to village of Rutherglen, area around Pimisi Bay, Mattawa River, Kennedy Lake, settlement of Eau Claire, Smith's Lake and Amable du Fond River; open farmland 20%, coniferous woods and black spruce bog 10%, second growth forest land of mixed coniferous and deciduous trees 60%, lakes and rivers 10%; snow developing into full snowstorm; temp. 14 to 18°F.; wind W to N 15 to 21 m.p.h.; ground covered with 13 inches of soft snow; all fresh water except rapids frozen. Total hours 7; total miles 35 by car, 5 on foot. American Golden-eye, 1; Pileated Woodpecker, 1; Hairy Woodpecker, 5; Downy Woodpecker, 1; Blue Jay, 6; Northern Raven, 1; Black-capped Chickadee, 49; Brown Creeper, 1; Common Starling, 3; Evening Grosbeak, 45; Redpoll, 23; Snow Bunting, 15. Total, 12 species, approx. 151

individuals. (Seen in area Dec. 23, Golden-crowned Kinglet, 2; Dec. 30, Tree Sparrow, 5; Pine Grosbeak 4). — L. C. Lawrence, Louise de Kiriline Lawrence.

Toronto, Ont. — Dec. 19, 1948; 7 a.m. to 5:30 p.m.; total hours, 114; weather, cloudy, mean temp. 27°F.; snowing (4" during the day); eighty observers in twenty-one parties. Red-throated Loon, 1; Great Blue Heron, 2; Whistling Swan, 1; Mallard, 333; Black Duck, 758; Pintail, 6; Blue-winged Teal, 1; Wood Duck, 1; Greater Scaup Duck, 907; Lesser Scaup Duck, 6; American Merganser, 130; Red-breasted Merganser, 1; Cooper's Hawk, 2; Red-tailed Hawk, 9; Rough-legged Hawk, 1; Marsh Hawk, 2; Sparrow Hawk, 6; Ruffed Grouse, 5; Pheasant, 158; Glaucous Gull, 1; Great Black-backed Gull, 23; Herring Gull, 1682; Ring-billed Gull, 131; Mourning Dove, 2; Screech Owl, 2; Great Horned Owl, 9; Barred Owl, 2; Long-eared Owl, 4; Short-eared Owl, 1; Kingfisher, 3; Flicker, 1; Pileated Woodpecker, 1; Red-headed Woodpecker, 1; Hairy Woodpecker, 10; Downy Woodpecker, 101; Blue Jay, 81; Crow, 5; Black-capped Chickadee, 259; White-breasted Nuthatch, 57; Red-breasted Nuthatch, 3; Brown Creeper, 41; Winter Wren, 9; Brown Thrasher, 1; Robin, 7; Golden-crowned Kinglet, 18; Ruby-crowned Kinglet, 1; Cedar Waxwing, 7; Northern Shrike, 2; Starling, 2501; House Sparrow, 2876; Red-winged Blackbird, 5; Bronzed Grackle, 1; Cardinal, 100; Purple Finch, 32; Common Redpoll, 4; Siskin, 2; Goldfinch, 120; Towhee, 2; Slate-colored Junco, 554; Oregon Junco, 1; Tree Sparrow, 423; Chipping Sparrow, 1; White-throated Sparrow, 2; Swamp Sparrow, 3; Song Sparrow, 60. Total, 68 species, 12130 individuals. — J. L. Baillie, J. Barnett, R. Bateman, O. Boggs, A. Brooks, A. Buckle, A. Bunker, J. Calladine, W. Carrick, C. H. D. Clarke, F. Cook, A. Cringan, A. Dawe, M. Devitt, O. Devitt, F. H. Emery, J. B. Falls, B. Foster, A. Ghent, G. Gibson, G. Giles, W. Giles, A. Gordon, W. W. H. Gunn, I. Halladay, P. Harrington, C. Helleiner, F. Helleiner, C. E. Hope, B. Hurst, M. Jackson, R. James, J. Kazden, M. Kazden, G. Lambert, A. Lamsa, R. Lanning, R. V. Lindsay, C. MacFayden, N. Martin, W. Martin, K. Mayall, W. McClelland, L. McDougall, M. McIlwraith, T. F. McIlwraith, D. Miller, M. H. Mitchell, A. Outram, J. Outram, D. Perks, A. Reid, R. Ritchie, J. Runnings, Jim Runnings, T. Russell, R. J. Rutter, J. Satterly, D. Scovell, R. Scovell, J. Sherrin, T. M. Shortt, D. Smith, F. Smith, W. Smith, L. L. Snyder, H. H. Southam, D. Speirs, J. M. Speirs, E. Stark, R. Tasker, S. L. Thompson, E. Thorn, R. Trowern, R. D. Ussher, M. Vanderwater, L. Walden, J. Walty, D. West, J. Woodford. (The Brodie Club).

Hamilton, Ont. (Dundas Valley W. to Ancaster, Hamilton and harbor, Burlington Beach, Bronte, Aldershot, Waterdown). — Dec. 26; 8 a.m. to 5 p.m.; clear, temp. —4° F. to 23°F.; wind S.W. 10 m.p.h.; ground bare to 1 inch old snow on heights; streams frozen, harbor open; 37 observers in 16 parties. Total hours, 83; total miles, 176 (114 on foot, 62 by car). Common Loon, 1; Holboell's Grebe, 2; Double-crested Cormorant, 1; Mallard, 12; Black Duck, 55; Redhead, 1; Canvas-back, 4; Greater Scaup, 45; American Golden-eye, 318; Buffle-head, 10; Old-squaw, 8; White-winged Scoter, 2; American Scoter, 1; Hooded Merganser, 5; American Merganser, 703; Red-breasted Merganser, 130; Cooper's Hawk, 3; Red-tailed Hawk, 11; Rough-legged Hawk, 4; Sparrow Hawk, 4; Ruffed Grouse, 13; Ring-necked Pheasant, 16; Coot, 3; Great Black-backed Gull, 47; Herring Gull, 1277; Ring-billed Gull, 8; Mourning Dove, 1; Screech Owl, 4; Horned Owl, 15; Barred Owl, 2; Long-eared Owl, 2; Belted Kingfisher, 1; Flicker, 4; Hairy Woodpecker, 12; Downy Woodpecker, 56; Horned Lark, 1; Blue Jay, 71; Crow, 3; Black-capped Chickadee, 230; White-breasted Nuthatch, 27; Brown Creeper, 29; Winter Wren, 3; Robin, 4; Golden-crowned Kinglet, 15; Cedar Waxwing, 25; Northern Shrike, 2; Starling, 2479; English Sparrow, 1157; Meadowlark, 4; Red-winged Blackbird, 1; Cowbird, 1; Cardinal, 80; Purple Finch, 37; Redpoll, 2; Goldfinch, 31; Vesper Sparrow, 1; Junco, 396; Tree Sparrow, 377; Swamp Sparrow, 4; Song Sparrow, 20. Total, 60 species, 7781 individuals. (Seen recently: Red-throated Loon, Wood Duck, Ring-necked Duck, Bald Eagle, Glaucous Gull, Kumlien's Gull, Bonaparte's Gull, Catbird, Evening Grosbeak, Pine Siskin, White-throated Sparrow). — Eric W. Bastin, Earl Biggrig, Thelma Borman, Neil Bourne, Mr. & Mrs. R. D. F. Bourne, Don Bucknell, Wm. Campbell, K. J. Cox, James Dowell, R. O. Elstone, Mrs. J. G. Farmer, Bob Finlayson, Ian Halladay, Donald Harvey Donald Holland, George Holland, A. B. Jackson, H. E. Kettle, Margaret Lamb, L. Laking, J. E. Martin, G. O. McMillan, Edward Moore, John Moule, George W. North, David Powell, Mrs. N. M. Robertson, Bob Sergeant, Laura Stewart, Gordon Sweatman, Ann Watson,

Mable Watson, Mr. & Mrs. M. R. Watters, J. H. Williams, Laurel E. Williams. (Hamilton Nature Club.)

Kitchener, Ont. (Westmount through limits of Waterloo, N.E. to Bridgeport; Grand River from Bridgeport to Breslau, Freeport and Blair; Preston to Galt). — Dec. 19, 1948; 9 a.m. to 5 p.m.; overcast; 28-31°F.; wind N.E. 10-15 m.p.h.; light snow; snow on ground; river half open; 25 observers in 7 parties; total hours, 119; total miles, 30 by car, 26 on foot. Mallard, 40; Black Duck, 171; Greater Scaup, 3; American Merganser, 15; Sharp-shinned Hawk, 1; Red-tailed Hawk, 2; Red-shouldered Hawk, 1; Ruffed Grouse, 7; Pheasant, 6; Herring Gull, 95; Ring-billed Gull, 4; Rock Dove, 27; Great Horned Owl, 1; Hairy Woodpecker, 3; Downy Woodpecker, 23; Blue Jay, 14; Crow, 2; Black-capped Chickadee, 144; White-breasted Nuthatch, 19; Brown Creeper, 15; Winter Wren, 1; Golden-crowned Kinglet, 32; Cedar Waxing, 21; Starling, 187; English Sparrow, 313; Cardinal 33; Purple Finch, 61; Redpoll, 5; Pine Siskin, 8; Goldfinch, 154; Junco, 24; Tree Sparrow, 76; White-crowned Sparrow, 1; White-throated Sparrow, 1; Song Sparrow, 9; Snow Bunting, 100. Total, 36 species, 1619 individuals. (Also seen near census date; Sparrow Hawk, 1; Kingfisher, 1; Robin, 1; Golden-eye, 20). — F. Bender, C. Bingham, R. Bish, N. Boehm, R. Brooman, Mr. and Mrs. E. M. Carter, Mr. and Mrs. R. M. Davis, F. W. R. Dickson, D. Gildner, Mr. and Mrs. H. H. Gould, R. C. Hilborn, D. Mowat, R. Pickering, G. Schaefer, W. Schaefer, F. Schantz, J. A. Smith, P. Smith, M. Schultz, R. Tilt, L. Wambold, D. Williamson. (The Kitchener-Waterloo Field Naturalists Club.)

Meaford, Ont. (East half of the town including the harbour and three feeding stations, part of the escarpment, II line north, St. Vincent township). — Dec. 27, 1948; 10 a.m. to 4 p.m.; temp. 25°F.; overcast except for an hour at noon; light W wind; visibility good; 12 observers in two parties. Horned Grebe, 1; Canada Goose, 1; Black Duck, 3; Lesser Scaup, 1; American Golden-eye, 12; Buffle-head, 4; American Merganser, 18; Turkey Vulture, 1; Hawk sp., 2; Ruffed Grouse, 11; European Partridge, 2; Herring Gull, 200; Rock Dove, 6; Great Horned Owl, 1; Pileated Woodpecker, 1; Hairy Woodpecker, 1; Downy Woodpecker, 5; Canada Jay, 1; Blue Jay, 3; Black-capped Chickadee, 63; White-breasted Nuthatch, 3; Brown Creeper, 5; Starling, 175; English Sparrow, 115; Cardinal, 3; Slate-coloured Junco, 17; Tree Sparrow, 35. Total, 26 identified species, 690 individuals. — L. H. Beamer.

St. Thomas, Ont. (Kettle Creek from city to a point two miles south; Pt. Stanley Harbour, White's woods, Waterworks area; Pt. Burnwell Harbour;cattail marsh 5%, grassy marsh 5%, pasture land 10%, deciduous woods 25%, pine woods 20%, lake shore 20%, creek banks, 15%).—Dec. 26; 8 a.m. to 5 p.m.; broken overcast; snow squalls during afternoon; temp. —4°F. at start, 15°F. at finish; wind W. at 20 m.p.h.; creek frozen except rapids, lake and harbour frozen about Pt. Stanley but open at Pt. Burwell; 5 observers in 3 parties. Total hours, 8; total miles, 40 (35 by car, 5 on foot). Mallard, 2; Black Duck, 150 (est.); American Merganser, 4; Hooded Merganser, 2; Buffle-head, 1; Herring Gull, 58; Ringed-billed Gull, 1; Great Black-backed Gull, 1; Bonaparte's Gull, 500 (est.); Glaucous Gull, 1 (F.B.); Cooper's Hawk, 1; Red-tailed Hawk, 6; American Rough-legged Hawk, 3; Marsh Hawk, 1; Bald Eagle, 2; Ring-necked Pheasant, 6; Rock Dove, 5; Mourning Dove, 3; Screech Owl, 4; Short-eared Owl, 7; Long-eared Owl, 12; Downy Woodpecker, 10; Horned Lark, 100 (est.); Blue Jay, 8; Crow, 2; Black-capped Chickadee, 25; White-breasted Nuthatch, 3; Brown Creeper, 4; Winter Wren, 2; Starling, 100 (est.); English Sparrow, 75 (est.); Cardinal, 17; Slate-coloured Junco, 35; Tree Sparrow, 150 (est.); Song Sparrow, 20; Snow Bunting, 1. Total 36 species, about 1172 individuals. — M. Field, F. Bodsworth, Campbell Miller, Wm. Stewart, D. Young.

London, Ont. (Valley of the Thames River from London to Delaware; Redman's swamp; Trott's swamp; coves and ponds; part of Dorchester swamp; J. C. Higgins' farm at Lobo; 4 feeding stations in the same area. Pasture 5%; deciduous woodland 20%; swamp 20%; mixed wooded river bank 55%). — Dec. 27, 1948; 8 a.m.—5.00 p.m.; sky overcast all morning clearing early afternoon; visibility poor at first; wind S.W. 20-25 m.p.h. abating mid-afternoon; 3 inches snow on the level; temp. 8 a.m. 18°F.; river mostly frozen, small stretches open, streams mostly frozen; 37 observers in 12 parties. Total party hours 72; total party miles, 50 on foot, 75 by car. Great Blue Heron, 1; Mallard, 2; Black Duck, 1; American Golden-eye, 46; American Merganser, 50; Sharp-shinned Hawk, 1; Cooper's Hawk, 2; Red-tailed Hawk, 15; Red-shouldered

Hawk, 1; American Rough-legged Hawk, 9; Bald Eagle, 3; Marsh Hawk, 5; Sparrow Hawk, 1; Ruffed Grouse, 3; Ring-necked Pheasant, 11; Herring Gull, 65; Ring-billed Gull, 7; Rock Dove, 71; Mourning Dove, 11; Screech Owl, 1; Great Horned Owl, 6; Belted Kingfisher, 2; Hairy Woodpecker, 5; Downy Woodpecker, 34; Blue Jay, 53; American Crow, 36; Black-capped Chickadee, 199; White-breasted Nuthatch, 38; Red-breasted Nuthatch, 2; Brown Creeper, 23; Winter Wren, 1; Golden-crowned Kinglet, 18; Common Starling, 547; English Sparrow, 859; Rusty Blackbird, 5; Cardinal, 135; Evening Grosbeak, 2; Purple Finch, 56; Redpoll, 25; American Goldfinch, 21; Slate-coloured Junco, 241; Tree Sparrow, 198; White-crowned Sparrow, 2; Song Sparrow, 38; Snow Bunting, 10. Total, 45 species, 2860 individuals. (Observed in the same area recently. Pileated Woodpecker, Dec. 25; Yellow-shafted Flicker, Dec. 25; Myrtle Warbler, Dec. 23; Short-eared Owl, Dec. 9). — Mary Abbott, Don Coleman, Dr. R. G. Cummings, Mrs. Cummings, John and Tom Cummings, Gerald Davies, Eli Davis, Kay Fetherston, Vernon Franks, Ted Garside, Mrs. W. G. Girling, Frank Girling, Ron Hambly, Mary and George Harvey, John Higgins, Don Higgins, Mary Hoffman, Howard Keast, Jim Leach, Alan Loughrey, Bessie Marwood, William Morris, Donald Pope, Helen and Ada Shipley, Rod Standfield, Mr. and Mrs. Miller Stewart, Douglas Soper, Margaret Stevens, Don Sutton, Dave Turnbull, Charlie Whitelaw, John and David Wismer. (McIlwraith Ornithological Club.)

West Elgin, Aldborough and Dunwich Twps., Ont. (area within a seven and a half mile radius of West Lorne; grassy marsh 2%, pasture land 16%, pine wood 2%, deciduous woodlots 50%, lake shore 5%, river banks 25%). — Dec. 27; 9 a.m. to 5.30 p.m.; high, complete overcast during morning, clearing at noon; temp. 18°F. at start, 20°F. at finish; 3 inches settled snow; wind W 15 m.p.h.; river frozen except rapids, Lake Erie free of ice; 7 observers in 4 parties. Total hours, 19 (18 on foot, 1 by car); total miles, 45 (24 by car, 21 on foot). American Golden-eye, 58; Black Duck, 1; Hooded Merganser, 1; Herring Gull, 14; Sharp-shinned Hawk, 1; Red-tailed Hawk, 3; American Rough-legged Hawk, 15; Red-shouldered Hawk, 1; Marsh Hawk, 5; Bald Eagle, 1; Bob-white, 1; Ring-necked Pheasant, 7; Ruffed Grouse, 1; Rock Dove 26; Mourning Dove, 23; Great Horned Owl, 4; Short-eared Owl, 6; Yellow-shafted Flicker, 1; Downy Woodpecker, 24; Hairy Woodpecker, 2; Blue Jay, 14; Crow, 4; Black-capped Chickadee, 68; White-breasted Nuthatch, 12; Brown Creeper, 3; Robin, 4; Golden-crowned Kinglet, 2; Starling, 87; English Sparrow, 197; Red-winged Blackbird, 1; Cowbird, 17; Cardinal, 60; American Goldfinch, 5; White-throated Sparrow, 1; Slate-coloured Junco, 122; Tree Sparrow, 496; Song Sparrow, 6. Total 37 species, 1194 individuals. — H. L. Lancaster, J. K. Lancaster, R. E. Lemon, V. E. Lemon, A. C. Steele, M. Steele, D. K. Willson. (West Elgin Nature Club.)

Blenheim, Kent Co., Ont. (Fargo, Blenheim, Morpeth, Cedar Springs, Erie Beach, Erieau and Rondeau Provincial Park; farm land 65%, water 20%, woods 12%, marsh 2%, town 1%). — Dec. 28; 8.30 a.m. to 5.00 p.m.; overcast with sunshine in p.m. for one-half hour; temp. 38°F. at noon; wind gentle to moderate; visibility fair; trace of snow in sheltered spots; Lake Erie open; Rondeau Bay partially frozen; Erieau Harbour open; marsh areas frozen. Twenty observers in 5 parties. Total party hours, 36; total party miles, 115 (30 on foot, 85 by car). Whistling Swan, 1; Canada Goose, 200; Canvasback, 7; American Golden-eye, 4; American Merganser, 27; Red-breasted Merganser, 2; Sharp-shinned Hawk, 1; Cooper's Hawk, 1; Red-tailed Hawk, 2; Rough-legged Hawk, 13; Bald Eagle, 7; Marsh Hawk, 7; Sparrow Hawk, 1; Ring-necked Pheasant, 1; American Coot, 6; Great Black-backed Gull, 2; Herring Gull, 150; Bonaparte's Gull, 2000; Rock Dove, 30; Mourning Dove, 91; Screech Owl, 1; Great Horned Owl, 1; Red-headed Woodpecker, 4; Hairy Woodpecker, 15; Downy Woodpecker, 41; Blue Jay, 43; Crow, 798; Black-capped Chickadee, 14; White-breasted Nuthatch, 5; Brown Creeper, 2; Winter Wren, 1; Robin, 17; Golden-crowned Kinglet, 30; Cedar Waxwing, 2; Common Starling, 244; English Sparrow, 1420; Red-winged Blackbird, 6; Rusty Blackbird, 75 (H.E.); Cardinal, 42; Evening Grosbeak, 1; Pine Siskin, 6; White-winged Crossbill, 4; Vesper Sparrow, 4; Slate-coloured Junco, 80; Tree Sparrow, 140; Field Sparrow, 3; White-throated Sparrow, 2; Song Sparrow, 2. Total, 48 species and 5556 individuals. (Seen recently, Long-eared Owl, Eastern Bluebird, Horned Lark and Snow Bunting.) — D. A. Arnott, C. M. Anderson, R. Barry, D. Blackburn, L. Bohn, Jane Bohn, K. Davey, H. English, H. Evans, C. J. Fox, R. E. Graves, W. M. Gray, C. H. Hand, W. King, G. F. Manson, Bob Manson, G. Mc-

Garvin, J. L. Whitlock, H. B. Wressell and C. H. Zavitz. (Members of Kent Nature Club and friends.)

Port Arthur-Fort William, Ont. (to Kakabeka Falls, and McKenzie). — Dec. 26, 1948; 9.00 a.m. to 5.30 p.m.; wind S.W. 20 m.p.h.; temp. −16 to 16°F.; humidity high; overcast, with snowflurries, then clearing slightly; 16 observers in 9 parties; total miles, 145 by car, 17 on foot. American Golden-eye, 1; Ruffed Grouse, 1; Herring Gull, 421; Rock Dove, 150; Downy Woodpecker, 1; Canada Jay, 1; Blue Jay, 2; Raven, 8; American Crow, 1; Black-capped Chickadee, 48; Hudsonian Chickadee, 1; Red-breasted Nuthatch, 13; Bohemian Waxing, 53; Cedar Waxing, 20; Starling, 195; English Sparrow, 1010; Evening Grosbeak, 17; Purple Finch, 16; Pine Grosbeak, 538; Pine Siskin, 39; Snow Bunting, 5; Redpoll, 228; Hoary Redpoll, 1. Total, 23 species, 2770 individuals. Mr. and Mrs. P. Addison; Dr. A. E. Allin and David Allin, Keith Denis and David and Norman Denis, Anthony de Vos, Mr. and Mrs. Ken Eoll and Christopher Eoll, Claude E. Garton, Lance Heald, Elliott Heslop, C. H. Philpott, J. Thompson. (Thunder Bay Field Naturalists Club.)

Yorkton, Sask. (area 15 miles in diameter with Yorkton as center). — Dec. 26, 1948; 9.00 a.m. to 5.00 p.m. Overcast in morning, clear in afternoon; SW wind at 10 m.p.h.; snow averaging six inches in depth; temp. 10° at start, 22° at noon; 10 observers in 4 groups. Total party hours afield, 9½ (4 by car and 5½ on foot); total party miles 42 (35 by car and 7 on foot). Sharp-tailed Grouse, 27; Great Horned Owl, 1; Hairy Woodpecker, 1; Downy Woodpecker, 2; Blue Jay, 8; Magpie, 4; Black-capped Chickadee, 9; American Robin, 1; Cedar Waxwing, 5 (robin and waxwings near open spring, beside "muskeg", just west of Yorkton; both species observed for fifteen minutes through 10 x 50 binoculars at distances as close as twelve feet; apparently first record of Cedar Waxwing in Saskatchewan during Christmas season — C.S.H.); European Starling, 4; English Sparrow, 179; Redpoll, 15; Snow Bunting, 342 (est.). Total, 13 species, approximately 598 individuals. (Four Cedar Waxwings noted on Dec. 28 and 9 on Jan. 1, in down-town Yorkton. No Bohemian Waxwings noted thus far this winter). — Wayne Bjorgan, Ken Bowes, Jerry Bulitz, D'Arcy Wershler, Merle Wershler, (Simpson School Nature Club); and Jim Allen, Neil Black, Brother Clarence, Dr. C. J. Houston, C. Stuart Houston (Yorkton Natural History Society).

Summerland, B.C. (South Okanagan Valley). — Dec. 19, 1948; 8 a.m. to 2 p.m.; overcast; strong S wind, reaching gale force at noon; about 6 inches drifting snow; temp. approx. 20°F.; 4 miles of lake front and adjoining fruit benches back to pine-clad hills; 6 observers in 4 groups. Canada Goose, 8; Mallard, 8; Gadwall, 13; Redhead, 8; Canvasback, 5; Scaup Duck, 6; American Golden-eye, 2; Goshawk, 1; Duck Hawk, 1; California Quail, 70; Ring-necked Pheasant, 142; American Coot, 83; Herring Gull, 3; Screech Owl, 1; Belted Kingfisher, 1; Flicker, 33; Downy Woodpecker, 1; American Magpie, 17; Raven, 1; Black-capped Chickadee, 4; Red-breasted Nuthatch, 2; Dipper, 1; Winter Wren, 4; Robin, 9; Western Bluebird, 6; Townsend's Solitaire, 1; Bohemian Waxwing, 30; Shrike, 2; House Sparrow, 200; Meadowlark, 3; Evening Grosbeak, 13; Purple Finch, 4; Redpoll, 27; Pine Siskin, 20; Goldfinch, 10; Junco, 649; Tree Sparrow, 2; Song Sparrow, 43. Total, 38 species, 1438 individuals. — William Fosberry, Herbert Simpson, Jack Fossick, John Holman, Muriel Holman, Eric Tait.

Crescent, B.C. (Bush and coast between Ocean Park and estuary of Nicomekl). — Dec. 29, 1948; 8.30 a.m. to 4 p.m.; melting snow; visibility fair; temp. 38°F.; approx. 6 miles on foot. Common Loon, 10; Holboell's Grebe, 1; Horned Grebe, 19; Western Grebe, 1; Double-crested Cormorant, 3; Pelagic Cormorant, 2; Great Blue Heron, 4; Mallard, 2; Pintail, 8; Green-winged Teal, 79; Canvasback, 37; Scaup Duck, 37; American Golden-eye, 58; Buffle-head, 18; Old-squaw, 1; Harlequin Duck, 8; White-winged Scoter, 27; Surf Scoter, 25; American Scoter, 11; Red-breasted Merganser, 4; Ring-necked Pheasant, 1; American Coot, 1; Killdeer, 5; Red-backed Sandpiper, 78; Glaucous-winged Gull, 46; Short-billed Gull, 24; Kingfisher, 1; Flicker, 1; American Crow, 35; Black-capped Chickadee, 15; Chestnut-backed Chickadee, 6; Winter Wren, 4; Bewick's Wren, 3; Varied Thrush, 19; Golden-crowned Kinglet, 6; English Sparrow, 12; Spotted Towhee, 7; Junco, 41; Fox Sparrow, 2; Song Sparrow, 7. Total, 42 species, 660 individuals. (Also 4 Bush tits on Jan. 4.) E. E. Woodford, M. W. Holdom.

Vancouver, B.C. (Outer harbour from Spanish Banks, around Point Grey to mouth of North Arm of Fraser River, N.E. by wooded trails to starting point). — Dec. 26, 1948;

9.30 a.m. to 4.30 p.m.; clear; visibility good; slight W. breeze; temp. 30°F.; approx. 12 miles on foot. Loon sp. 7; Holboell's Grebe, 15; Western Grebe, 21; Pied-billed Grebe, 5; Baird's Cormorant, 5; Snow Goose, 750 (est.); Mallard, 12; Green-winged Teal, 2; Wood Duck, 3; Lesser Scaup, 81; American Golden-eye, 117; Barrow's Golden-eye, 50; Buffle-head, 11; Old-squaw, 5; Harlequin Duck, 9; White-winged Scoter, 5; Surf Scoter, 38; American Scoter, 54; Merganser sp. 7; Cooper's Hawk, 3; Bald Eagle, 2; Marsh Hawk, 1; Killdeer, 17; Wilson's Snipe, 1; Glaucous-winged Gull, 260; Herring Gull, 400; California Gull, 29; Gull sp., 350; Pigeon Guillemot, 18; Barn Owl, 1; Great Horned Owl, 1; Snowy Owl, 5; Short-eared Owl, 4; Pileated Woodpecker, 3; Harris's Woodpecker, 4; Downy Woodpecker, 7; Steller's Jay, 1; Blue Jay, 3; Northwest Crow, 29; Oregon Chickadee, 27; Coast Bush-tit, 39; Winter Wren, 11; Bewick's Wren, 7; Robin, 26; Varied Thrush, 43; Crested Mynah, 17; English Sparrow, 72; Red-winged Blackbird, 140; Brewer's Blackbird, 78; Pine Siskin, 44; Oregon Towhee, 8; White-crowned Sparrow, 31; Fox Sparrow, 3; Song Sparrow, 24. Total, 53 species, approx. 2900 individuals. — Harry Middleton.

Courtenay-Comox, Vancouver Island, B.C. (1 mile W. of Courtenay through Courtenay, around river and along river bank and estuary to Comox with side trips). — Dec. 27; 9 a.m. to 4.30 p.m.; cloudy; calm; temp. 28-30°F. Observers together on foot. Common Loon, 3; Holboell's Grebe, 2; Horned Grebe, 2; Western Grebe, 1; Crested Cormorant, 11; Pelagic Cormorant, 7; Northwest Coast Heron, 5; Mallard, 75; Baldpate, 90; Green-winged Teal, 5; Wood Duck, 1; Canvas-back, 3; Greater Scaup, 170; American Golden-eye, 100; Buffle-head, 29; White-winged Scoter, 150; Surf Scoter, 40; (also at least 1000 unidentified ducks mainly scoters); Hooded Merganser, 3; American Merganser, 19; Red-breasted Merganser, 1; Bald Eagle, 1; Oregon Ruffed Grouse, 1; Ring-necked Pheasant, 6; Coot, 21; Killdeer, 10; Black Turnstone, 1; Glaucous-winged Gull, 600; Herring Gull (Thayer), 3; Short-billed Gull, 4; Screech Owl, 1; Pigmy Owl, 1; Belted Kingfisher, 2; Red-shafted Flicker, 2; Harris's Woodpecker, 1; Red-breasted Sapsucker, 1; Steller's Jay, 2; Raven, 4; Western Crow, 8; Northwest Crow, 500; Oregon Chickadee, 10; Brown Creeper, 1; Seattle Wren, 2; Winter Wren, 4; Robin, 1; Varied Thrush, 11; Golden-crowned Kinglet, 5; English Sparrow, 10; Western Meadowlark, 20 (est.); Brewer's Blackbird, 2; Purple Finch, 1; Pine Siskin, 85; Oregon Towhee, 11; Oregon Junco, 27; Fox Sparrow, 2; Song Sparrow, 14. Total, 55 species, approx. 3100 individuals. — Ralph Fryer, Theed Pearse.

PROPOSALS IN BOTANICAL NOMENCLATURE[1,2]

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THE FOLLOWING PROPOSALS are to be submitted to the next International Congress of Botanical Nomenclature. They were accumulated over a period of years starting in 1941, but quite a few were suggested by the reading of the mimeographed copy of the Ballots for Proposed Amendments to the International Rules of Botanical Nomenclature sponsored by the American Society of Plant Taxonomists etc., 1948. With editorial permission, I will quote from this mimeographed book and for convenience will refer to it as the "Ballots". Somehow, I missed the notice announcing the coming of the "Ballots" and was thus unable to use them as a medium of publication, but the first draft of this paper was submitted to the editors of the "Ballots" and they have extracted a number of comments that will appear in the final printed edition of the "Ballots". Most of these are not repeated here. To the editors of the "Ballots" and especially to Prof. C. A. Weatherby and Dr. W. H. Camp, I wish to express my thanks for their cooperation and numerous and interesting suggestions. Other members of our staff have also offered helpful suggestions and comments, namely Drs. H. A. Senn, D. B. O. Savile, and J. W. Groves. The latter two have also contributed one proposal each.

[1] Received for publication March 15, 1949.

[2] Contribution No. 655, Botany and Plant Pathology Division, Science Service, Dom. Department of Agriculture, Ottawa, Ontario.

Except when otherwise stated, all the following proposals are submitted by the author of this article and seconded by Dr. H. A. Senn.

Art. 7

PROPOSAL: Add the following:

"Names of taxonomic groups are normally in the nominative singular or plural, sometimes in the genitive, but they are susceptible to vary in case and number whenever so required by usage or grammar.

"Examples; Monographia *Potentillarum;* Species *Batorum;* Differt a *Carice laxiore...; Corni oppositifoliae;* Folia var. *typici...*"

ARGUMENT: See, in the "Ballots", Dr. H. W. Rickett's proposal concerning Art. 25. This proposal is quite similar, only more inclusive. His proposal would permit names of genera to vary in number whenever so required by the syntax.

Art. 12

PROPOSAL: After "Forma" add:

"Subforma"

ARGUMENT: The term "Subforma" appears elsewhere in the rules; e.g. Art. 28, *Saxifraga Aizoon* subforma *surculosa.* Since this term is occasionally used, there seems to be no reason why it should not appear at its logical place in the Rules.

Art. 12

PROPOSAL: At the end of the first paragraph, delete the following: "Individuum"

ARGUMENT: By definition, an individual is not a category but a unit, the kind of unit for which categories are made, and it seems that this term should not appear in a list of subordinated categories. Undoubtedly there are many cases where a species or other group is known from a single individual, but to provide different names for each individual plant is not the purpose of plant taxonomy. Art. 12 as it now stands, implies that each individual is a category susceptible of being given a name distinct from all other names. To follow such a course would defeat the purpose of taxonomy.

NOTE: If either this or the preceding proposal is accepted, it will be necessary to change Art. 12 to read either "twenty-two" or "twenty-four" where "twenty-three" now appears. If both are accepted or rejected, no change will be necessary.

Art. 21

PROPOSAL: Under Note 4, delete the first example *(Spergularia* versus *Alsine)* and substitute:

"*Listera* R. Br. (1813) is conserved against *Diphryllum* Raf. (1808); it is also conserved against *Bifolium* Pétiver, Opera, ed. Millan, t. 70, fig. 10, 11, 12 (1764), as adduced by Nieuwland, in Amer. Midland Nat. iii. 128 (1913) (if Pétivier's name be regarded as validly published), though *Bifolium* is not mentioned among names to be rejected."

ARGUMENT: This interesting example is made worthless and incorrect by Art. 62. According to the latter, *Alsine* is a characteristic example of a *nomen ambiguum* and must be rejected. The substitute example was supplied by Prof. C. A. Weatherby.

Art. 23

PROPOSAL: After "one of their genera" add:

"(pre-Linnean or later)"

ARGUMENT: Since pre-Linnean names are generally disregarded, see Art. 20, it seems preferable to make it quite clear that this Art. 20 does not apply to Art. 23 for this particular case.

Art. 23

PROPOSAL: After Art. 23 add the following:

"Note: Those who prefer may use regularly formed family names as follows: *Arecaceae* Reich. *(Palmae); Poaceae* Br. *(Gramineae); Brassicaceae* Lindley *(Cruciferae); Fabaceae* Reich., from a pre-Linnean genus *(Leguminosae;* those who wish to recognize segregate families may also use *Mimosaceae* Reich. and *Caesalpiniaceae* Kl. & Grcke.*) *Hypericaceae* Lindley* *(Guttiferae;* those who wish to recognize a segregate family may also use *Clusiaceae* Lindley); *Ammiaceae* Presl *(Umbelliferae); Lamiaceae* Lindley *(Labiatae); Asteraceae* Lindley* *(Compositae;* those who wish to recognize segregate families may also use *Ambrosiaceae* Reich. and *Cichoriaceae* Reich.).

"When segregates of any of these 8 families are recognized, then only names regularly formed in *aceae* should be used.

"Example: If the *Compositae* are segregated in 3 families typified by *Aster, Ambrosia,* and *Cichorium,* the family names to be used are respectively: *Asteraceae, Ambrosiaceae,* and *Cichoriaceae.*"

ARGUMENT: Much of this proposal is taken verbatim from a proposal by Dr. W. H. Camp published in "Ballots". Camp's pro-

* Nom. fam. conserv. propos.

posal was to make all family names to end in *-aceae* without exception, but it was rejected.

The 8 names concerned *(Palmae, Gramineae, Cruciferae, Leguminosae, Guttiferae, Umbelliferae, Labiatae* and *Compositae)* are all but one names of large families, widespread in distribution, economically important, well characterized and easily recognized, and these names have a high mnemotechnic value due to their being terms that point out or describe an important and conspicuous characteristic of each one of the families concerned. This quality coupled with their having been in common use for such a long time weighs heavily in their favour and I consider it advisable to retain them although not regularly formed. After all our Rules of Nomenclature are, and ought to be, a codification of current usage more than anything else. But especially in North America and in the last 50 years, regularly formed substitutes such as *Poaceae, Asteraceae,* etc. have been quite frequently used even in major reference publications (e.g. "North American Flora", Rydberg's numerous floras). Until common usage becomes more preponderant one way or the other, it seems better to provide for the use of both types of names. Time has demonstrated that too large a body of botanists is unwilling to abide by Art. 23 as it presently stands.

The second paragraph of the proposal takes into account the fact that these 8 exceptional family names lose much of their mnemotechnic value when segregate families are recognized.

Art. 24

PROPOSAL: Add the following paragraph:

"The name of the subfamily that includes the type genus is usually formed after this same type genus. Similarly with tribes and subtribes when they include the type genus of a tribe, or subfamily, or family.

"Example: *Asclepiadaceae* and *Asclepiadeae* (from and including *Asclepias).*"

ARGUMENT: This will bring names of subtribes, tribes, and subfamilies in line with the names of orders, suborders (Rec. IX), families (Art. 24), and subdivisions of species (proposed Art. 30 bis).

Rec. X

PROPOSAL: In the first sentence delete the following: "show judgement and taste by attending" and substitute:

'should attend"

Proposed by J. W. Groves
Seconded by B. Boivin.

ARGUMENT: When it comes to nomenclature, botanists will undoubtedly show taste and judgement if they try to follow our Rules as best as they can and not to infringe on either our Rules or Recommendations without serious reasons. But disagreement with our present Rules of Nomenclature including Rec. X is not necessarily a mark of lack of taste and judgement. Often such disagreement brings about changes and improvements in our Rules.

This Rec. X has been amended in the past and is always susceptible of being amended in the future, which only goes to show that standards of taste and judgement are somewhat contingent to times and places. Why set such a rule to gauge by any botanist who dares propose a new generic name?

The International Rules of Nomenclature are essentially a matter of convenience and common agreement and not a standard of taste and judgement, and it would seem preferable not to include any such considerations in Rec. X, just as none appear in the rest of the Rules. This Rec. X, as it presently stands, is a slight slander on anybody who does not abide by it.

Art. 26

PROPOSAL: Delete paragraph (d) of Recommendation XI and change Art. 26 to read as follows:

"Names of subgenera are always substantives resembling the names of genera. Names of sections are either substantives resembling the names of genera or adjectives in the plural number and agreeing in gender with the generic name and written with an initial capital. Names of subsections and other lower divisions above the rank of species or preferably adjectives in the plural number agreeing in gender with the generic name and written with an initial capital or their place may be taken by an ordinal number or letter. Within a genus, the name of all subdivisions having the same rank generally take the same form."

ARGUMENT: This more explicit wording of Art. 26 is intended to cover current practice in North American botany. Two similar proposals have already been advanced by Dr. A. Rehder.

The original proposal as it appeared in Journ. Arn. Arb. **20:** 269-270, 1939, seems to be quite acceptable, but the one that appears in the "Ballots" has a substantially different wording as it calls for not only names of subgenera but also for names of sections and

subsections to be substantives. The new wording by Rehder would also make Article 26 compulsory.

Names of groups between the ranks of genus and species have a much more limited use than either generic or specific names. They are primarily used by monographers as convenient terms to designate groups of species more closely related together. In floristic works, names of subgenera, sections, and subsections are generally omitted although they are frequently used in some of the larger genera such as *Rubus, Crataegus, Rosa,* and especially *Carex.* Note that section names currently used in North America floras are generally of the adjectival form, and this is especially the case for the above 4 genera. Thus current practice in North America runs against both Article 26 as it stands and against Rehder's proposal, and if the Rehder proposal is accepted thousands of currently used names of sections will be invalidated and new names will have to be created or old ones dug up. Is such a change worth while?

It seems to me that except in very large genera the usefulness of sections and subsections does not transcend the pages of a monographic study. Because neither the Kew Index, nor the Gray Index list subgenera, sections and other names of groups between the ranks of genus and species, it is not advisable to legislate about them in a rigid manner. Monographers have enough problems already and it seems unwise to impose upon them unnecessarily rigid rules on names of such secondary importance as those of sections and subsections.

On the other hand a compulsory regulation to have all subgeneric names similar in form to generic names is sensible and advisable because subgenera are frequently elevated to generic rank. The additional sentence proposed by Rehder to have the names of all co-ordinated subdivisions of a genus take the same form is quite sensible and it would promote uniformity at least within each genus.

The last sentence of Rehder's proposal is also partly in contradiction with the rest of the Article 26. In this article, 4 different forms are listed for genera, sections, etc. namely: substantives, adjectives, numbers, and letters, but the last sentence proposed by Rehder recognizes only substantives and adjectives.

Rec. XVIII

COMMENT: In the "Ballots" appears a proposal by Dr. H. A. Gleason to delete Rec. XVIII and substitute an Art. 30 bis that would provide automatically a name for the typical phase of a species or subdivision of species. I would prefer to see Gleason's proposal, or a similar proposal, to be accepted, but should Rec. XVIII be retained as is, the following proposal is advanced:

PROPOSAL: After "etc.", add the following:

"even though an older name may be available"

And add the following to the examples:

"*Thalictrum alpinum* L. var. *typicum* Boivin 1944. This latter name may be used although it included, when published, not only the specific type, but also the types of the following varieties: var. *pallidum* Norman 1883, var. *gaspense* Greene 1909, var. *microspermum* Greene 1909, var. *nesioticum* Greene 1909, var. *pudicum* Greene 1909."

ARGUMENT: To enforce strictly the rule of priority for the name of the typical phase would, in quite a number of cases, result in different botanists using different names for the typical phase, depending upon their taxonomic treatment of the variations of the species concerned.

For example, botanist X might consider var. *stipitatum* Yabe 1903 and var. *hebetum* Boivin 1944 as the only distinct varieties of *Thalictrum alpinum* L. and to him the oldest available name for the typical phase of the species would be var. *pallidum* Norman 1883.

To the modern botanist Y who would follow Norman and recognize only var. *pallidum* Norman as worthy of distinction, the typical phase would carry the name of var. *stipitatum* Yabe 1903.

To botanist Z who not only agrees with Greene that vars. *gaspense, microspermum, nesioticum,* and *pudicum* Greene 1909 are good and distinct varieties, but also recognizes var. *pallidum* Norman, var. *stipitatum* Yabe and var. *hebetum* Boivin as distinct varieties, the only name presently available for the typical phase of this species is var. *typicum* Boivin 1944.

Thus these three botanists may use the following names respectively:

X, var. *pallidum* Norman
Y, var. *stipitatum* Yabe
Z, var. *typicum* Boivin

to designate the same thing, namely the typical phase of *Thalictrum alpinum* L. Furthermore, while botanists X and Z would use var. *stipitatum* Yabe to designate a distinct entity occurring only in Eastern Asia,

this same name would be used by botanist Y to designate the typical phase of the species as it occurs in Northern Europe.

This situation is obviously contrary to the purpose of the Rules as expressed in Art. 4, which reads, in part, as follows: "The essential points in nomenclature are: (1) to aim at fixity of names; (2) to avoid or to reject the use of forms and names which may cause error or ambiguity or throw science into confusion."

N.B. For the purpose of this discussion, the above example, drawn after the varieties of *Thalictrum alpinum* L., takes into account only those names for which a complete bibliographical reference is given in Rhodora 46: 353-9, 1944. A number of other varieties have also been described for the European plant.

Art. 30 bis

In the "Ballots" there is a proposal by Dr. H. A. Gleason to delete Rec. XVIII and substitute a new Art. 30 bis.

This proposal is a pleasant step towards greater simplicity. There are a great many species of which subspecies, varieties and forms have been described without a corresponding *typicus* unit being set up immediately. This leaves us, especially in America, without proper published designation for the typical and usually more important phase of a great many of our plants. Gleason's proposal would obviate this defect by providing names automatically and simply for all subspecific units that include the type of a higher unit.

Both of Gleason's proposals concerning Art. 28 and Art. 30 bis may perhaps be advantageously combined in the following proposal:

PROPOSAL: Delete Rec. XVIII including the examples, and substitute the following:

"Art. 30 bis The description of a subspecific group which excludes the type of the species or of the next higher subspecific unit automatically creates a subspecific group of equal rank which has as its type the type of the next higher unit and is automatically designated by repeating the epithet of the next higher unit. This repeated epithet needs no formal publication and has no authority. Any other epithet for a subspecific group including the type of the next higher unit is treated as illegitimate.

"Example: The publication in 1843 of *Lycopodium inundatum* L. var. *Bigelovii* Tuck, automatically creates another group of equal rank which includes the Linnean type and which shall be called: *Lycopodium inundatum* L. var. *inundatum* and not *Lycopodium inundatum* L. var. *typicum* Wherry."

The adoption of Gleason's proposal would implicitly render illegitimate all formerly published names for all subspecific units that include the type of the next higher group. This may be explicitly expressed as above.

Rec. XVIII

COMMENT: Should Rec. XVIII be retained substantially under its present form, the following proposal may be considered:

PROPOSAL: Add the following note:

"Note. When a tautonym is or has been proposed to designate the subdivision which includes the nomenclatural type of a higher subdivision, this tautonym is treated as a new name *(nom. n.)* and not as a new combination *(stat. n.)*.

"Example: *Achillea Millefolium* L. ssp. *Millefolium* Hayek (and not ssp. *Millefolium* (L.) Hayek); *Daucus Carota* L. ssp. *Carota* Thellung (and not ssp. *Carota* (L.) Thellung)."

ARGUMENT: As pointed out by Nils Hylander (Upps. Un. Arsskr. **1945,7**: 13. 1945) it is somewhat illogical to transfer a specific epithet under itself thus creating trinomials such as *Daucus Carota* L. ssp. *Carota* (L.) Thellung in which the epithet *Carota* is simultaneously given two different and legitimate ranks and in which an epithet retains its original use even after it has been given a new one. To correct this it is not necessary to treat these names as illegitimate or even to change their spelling (e.g. ssp. *eu-Millefolium)* as proposed by Nylander. The simple expedient of treating such names as new names even if they were originally proposed as new combinations seems sufficient.

Rec. XVIII or Art. 30 bis

PROPOSAL: Add the following note:

"Note. The greek letter a is traditionally reserved for the variety which includes the type of the species (sometimes of the subspecies)."

ARGUMENT: This practice of reserving the greek letter a for the variety which includes the type has been followed quite consistently and is of importance especially when varieties are elevated to specific rank and when it becomes necessary to select a lectotype.

Rec. XX bis

PROPOSAL: After Art. 43 insert the following:

"Recommendation:

"XX bis. When describing a new monotypic genus, a separate generic description that emphasizes the differential characters of the new genus, (arrangement of floral parts, etc.) as distinct from details of the species (color, size, etc.) is to be preferred."

Proposed by D.B.O. Savile
Seconded by B. Boivin.

Art. 40

PROPOSAL: Complete the sentence as follows and add the following example:

" . . . or if it is published in an index unless it is obvious that the author actually intended to use the index as a proper place for publishing the name of this particular taxonomic group.

"Example: *Hedysarum Mackenzii* f. *canescens* 1902 published in a periodical was listed in the index as var. *canescens* without any indication that the author had actually changed his opinion as to the proper rank to assign to this entity. The latter is not validly published and does not render illegitimate the later *H. Mackenzii* var. *cinerascens* 1940 although the former name was listed in the synonymy of the latter.

ARGUMENT: Indices are primarily convenient reference tools and not media for scientific publication. Furthermore their author is hardly ever stated although, especially in the case of periodicals, the author of the index is not necessarily the same as the author of the text referred to. It seems that in most cases any new name or status published in an index must be considered as either the result of an error, or as not definitely accepted by the author of the text, or as an inadvertent publication. If the author actually intended to use an index to correct, or change, or propose any name, it is up to him to make it clear that he actually intended to do so, as has sometimes been done.

Art. 45

PROPOSAL: In the examples, change the sentence regarding Willdenow's *Species Plantarum* to read as follows:

"Individual parts of Willdenow's *Species Plantarum* were published as follows: vol. I, part 1, 1797; vol. I, part 2, 1798; vol. II, part 1, 1799; vol. II, part 2, 1800; vol. III, part 1 (to page 850), 1800; vol. III, part 2 (to page 1470), 1802; vol. III, part 3 (to page 2409), 1803 (and later than Michaux's *Flora Boreali-Americana);* vol. IV, part 2, 1806; and not in the years 1797, 1799, 1800 and 1805, respectively, which appear on the title-pages of the volumes, it is the former series of dates which takes effect. (Vide: Rhodora 44: 147-150. 1942).

ARGUMENT: This proposal incorporates the findings published by Dr. B. C. Schubert, Willdenow's Species Plantarum and Michaux's Flora Boreali-Americana: Dates of Publication, Rhodora 44: 147-150. 1942.

Rec. XXI

PROPOSAL: After "indicating its type" add: "and where it is preserved."

ARGUMENT: Great importance is now attached to type specimens. But such specimens, especially the types of older authors, are not always easy to locate. An indication of the herbarium in which a type is preserved is almost always useful. It is now a fairly common practice to indicate where type specimens of new categories are located. This proposal would thus agree with present usage and at the same time would help make it still more general.

Art. 48

COMMENT: The distinction between the words *in, ex* and *apud* is not always easy and its usefulness, if any, is not obvious to me. As a matter of fact, I have never noticed that this distinction served any purpose whatsoever. Whether a name is published by author A in the works of author B, or author A supplied the name and description and B published it, or an herbarium name or nomen nudum of author A is picked up and validly published by author B, the end result is the same; the name is credited to author A and the complete reference will include mention of author B. Therefore I would like to advance the following which also incorporates C. A. Weatherby's proposal concerning names credited to "Hort.":

PROPOSAL: Change Art. 48 to read as follows and delete Rec. XXXII quater:

"When a name of a taxonomic group has been proposed by one author and is published by or in the works of another author, or editor, the name is credited to the first author followed by *ex* (or *in,* or *apud*) and the name of the second author or editor. The same holds for names of horticultural origin credited to "Hort."

"If it is desirable or necessary to abbreviate such a citation, the name of the original author must be retained, except that for names of garden origin, cited as "Hort.," only the publishing author need be cited.

"Examples: *Capparis lasiantha* R. Brown ex DC. or *Capparis lasiantha* R. Brown; *Gesneria Donklarii* Hort. ex Hooker or *Gesneria Donklarii* Hooker. *Thalictrum microgynum* Lecoyer in Hook. Ic. Pl. 18: 1766. 1888; *Pittosporum viridiflorum* Sims in Curtis Bot. Mag. 41: 1684. 1815".

ARGUMENT: The above would be more in agreement with current practice and the policy of distinguishing between *in, ex* and *apud* would still be permissible to those who prefer to do so.

The distinction between the words *in* and *apud,* is quite arbitrary, but any legislative body, including an International Botanical Congress, has the privilege of defining words in whatever manner seems best suited to its purpose.

In the present case it does not seem that the distinctions between *in, apud* and *ex* have any practical usefulness. Futhermore these distinctions are not always possible. At any rate a large body of botanists seem either to disregard them or to be confused by them.

Rec. XXX

PROPOSAL: Change to read as follows:

"XXX Author's name placed after plant names may be abbreviated as follows if convenient:

"(1) Preliminary letters and particles, such as *de, du, von, van,* etc. are omitted.

"(2) Titles such as *Baron, Doctor,* etc. are equally omitted.

"(3) Names of one or two syllables are not generally abbreviated.

"(4) Names of three or more syllables are generally abbreviated to the first syllable plus the consonants at the beginning of the second syllable.

"Examples: Cham. (for, Adalbert von Chamisso), Desf. (for R. L. Desfontaines).

"(5) In cases of joint authorship, each name may be abbreviated to its first syllable and the consonants at the beginning of the second syllable. Sometimes each name may be abbreviated to its first letter. Compound names may be abbreviated the same way.

"Examples: Fern. & Weath. (for Fernald and Weatherby), C. & S. (for Chamisso and Schlechtendal), R. & S. (for Roemer and Schultes), HBK. (for Humboldt, Bonpland & Kunth), BSP. (for Britton, Sterns and Poppenberg), H.-M. or Hand.-Mazz. (for Handel-Mazzetti).

"(6) Two authors with the same family name may be distinguished by their initials or, if one is the son of the other by the abbreviation f. (for filius), etc. If the earlier author is the better known one, only the later author or authors need diacritic initials or abbreviations.

"Examples: D. Don and G. Don., L. and L.f., DC. and A. DC., Gray and S.F. Gray.

"(7) Well established abbreviations may be retained even if not in agreement with the above.

"Examples: DC. (for A. P. de Candolle), L. (for C. Linnaeus), Br. (for R. Brown), Sm. (for J. E. Smith), W. (for Willdenow), Mx. (for A. Michaux).

"(8) In titles and in publications intended for the general public it is preferable not to abridge."

ARGUMENT: Abbreviations save space in books and save time in writing. But when too numerous they become difficult to memorize and force botanists to waste time looking them up in indices. In a book such as the 1908 edition of the Gray's Manual, a book of 926 pages, the total amount of space saved by authors abbreviations is about 5 pages and this is largely offset by the necessity of using 3 pages at the beginning of the book to explain author abbreviations. And not all abbreviations are worthwhile. Such as Ait. for Aiton, Mill. for Miller, Poir. for Poiret, Michx. for Michaux represent a saving of only one space each. And what to say about Cyrill. for Cyrillo? Still, abbreviations of this type constitute about half of the total number of author's names abbreviated in that book. If the only author's name abbreviated had been L. for Linnaeus, the total amount of space saved would have been 3 pages of abbreviations at the beginning and almost 3 pages throughout the text. Total net gain: a fraction of a page and an appreciable load taken off the memory.

It is therefore suggested that the abbreviations be fewer in number and that only those abbreviations be used that represent a appreciable saving of time and space.

Otherwise the present proposal does not differ from present usage.

Rec. XXXII bis

PROPOSAL: Change "F. v. Muell." to read as follows:

"F. Muell."

ARGUMENT: The letter "v", being an abbreviation of "von", is contrary to Rec. XXX. Many other such minor changes should be made to bring some uniformity into the text of the Rules.

Rec. XXXII quater

COMMENT: In case the aforementioned proposal re Art. 48 should be rejected, the following proposal may be considered:

PROPOSAL: Delete Rec. XXXII quater and transfer its text complete with examples to Art. 48.

ARGUMENT: Rec. XXXII bis to Rec. XXXII septies deal with the citation of names in synonymy, except Rec. XXXII quater which deals with the use of "in". By transferring this text to Art. 48, all the text relating to the use of "in" would be brought together and the series of recommendations from XXXII bis to XXXII septies would become homogeneous.

Rec. XXXII quinquies

PROPOSAL: After the words "should be appended", add:

", or if the type is excluded the words typo excluso, typo excl.) should be appended;"

Rec. XXXIV

PROPOSAL: Delete the last sentence.

Seconded by J. W. Groves & D.B.O. Savile.

ARGUMENT: In the "Ballots" there appears a proposal by Dr. F. R. Fosberg to revamp Rec. XXXIV and delete the last sentence of this recommendation. Fosberg's proposal was rejected but it seems that part of his proposal was quite justified namely; to delete the last sentence of Rec. XXXIV. Indeed the subdivisions concerned cannot be raised to generic rank, but the original generic names must be restored intact.

Rec. XXXV

COMMENT: Should the present proposal for a new Art. 30 bis or any similar proposal be adopted, the following change will become necessary.

PROPOSAL: Delete from the word "designated" to the end and substitute as follows:

"designated by repeating the same epithet, as per Art. 30 bis.

"Examples: *Stachys recta* ssp. *recta; Alchemilla alpina* var. *alpina*".

Art. 58

PROPOSAL: Replace the following:

"(see Art. 60, 61)"

by:

"(see Art. 61)"

ARGUMENT: There is nothing under Art. 60 about later homonyms except, under section (3), a further reference to Art. 61.

Art. 58

PROPOSAL: Add the following paragraph:

"When, on transference to a different rank, the name of a group has been applied erroneously in its new position to a different group, the new combination or status must be retained for the plant on which the former combination or status was based, and must be attributed to the author who first published it.

"Examples: On their 1815-8 Expedition, Chamisso and Eschscholtz collected a plant on which *Arnica frigida* Meyer 1926 and *Arnica angustifolia* Vahl β *Lessingii* T & G. 1843 were independently based. In 1900 Greene made the transfer *Arnica Lessingii* (T. & G.) Greene, but the accompanying description applied only to *Arnica Porsildiorum* Boivin 1948. When retained at the specific rank the plant of Chamisso is called *Arnica Lessingii* (T. & G.) Greene and the plant described by Greene is called *Arnica Porsildiorum* Boivin".

ARGUMENT: This proposal is parallel to the second paragraph of Art. 55. The proper application of a transfer cannot be made contingent on the proper interpretation of the name by the man who proposed the transfer.

Art. 60

PROPOSAL: Delete "(see Art. 2)" and substitute:

", that is, if it is contrary to a rule."

ARGUMENT: This proposal is part of a series intended to simplify Art. 60 and it might be advisable to consider all of them simultaneously. However each one of these proposals is justifiable separately and there is always the possibility that some of these proposals might not prove acceptable while others would be agreeable to the majority. They are therefore presented separately.

By repeating the definition of an illegitimate name, the present proposal would make the first sentence of Art. 60 easier reading and self sufficient, with only a very slight increase in length. The Art. 2 referred to is a quarter page article.

This Art. 60 is very heavy reading, especially because the reader is referred to 10 other articles. This present proposal, if adopted would make it easier for the reader to realize quickly that the enumeration that follows does not by any means include all the cases in which a name may be illegitimate. A name may also be illegitimate if contrary

to Art. 51, 53, 55, 64, 65, 66, etc., indeed if contrary to any one of the Rules.

Art. 60

PROPOSAL: In front of the second paragraph insert:

"Art. 60 bis."

ARGUMENT: As presently constituted, Art. 60 looks as if it contained a complete list of cases of illegitimacy, but the list is in fact quite incomplete.

This ambiguity would be automatically removed by placing this enumeration in an article of its own.

Art, 60 bis (or 60)

PROPOSAL: Delete subdivisions (2), (3), (4), and (5) and change the beginning paragraph of this enumeration to read as follows:

"A name of a taxonomic group is illegitimate if it was nomenclaturally superfluous . . . etc."

ARGUMENT: This enumeration being very incomplete, it is so much dead wood and liable to confuse people. Under Art. 2 an illegitimate name is defined as a name "contrary to a rule." A complete list of the Rules which may render a name illegitimate would include much more than Art. 16, 50, 52, 54, 61, 67 and 68.

On the other hand subdivision (1) contains a rule that is not repeated elsewhere and should therefore be retained.

The retention of the examples under subdivision (2) does not seem to me to be necessary. The first one of these examples (re: *Tetragonolobus)* already appears under Art. 54. The other example (re: *Seseli),* is almost a duplicate of another example (re: *Cucubalus)* under subdivision (1) of Art. 60.

Art. 60 or 60 bis (Alternate proposal)

COMMENT: The preceding proposal, if accepted, would greatly simplify our present Art. 60 by eliminating the incomplete enumeration of Articles under which a name may become illegitimate. If however it is felt that this enumeration still serves a useful purpose, the opposite course may well be worth considering, namely: a proposal to make the said enumeration complete. I find it impossible to prepare now, in 1949 an enumeration that will still be complete and accurate after the 1950 Congress. The editors of our next text of the International Rules should therefore be authorized to add or substract from this enumeration as much as may be necessary to bring it into line with our Rules of Nomenclature as they will actually stand after the Congress has acted on each one of the forthcoming proposals. Also the vote on this proposal should be on the principle of the proposal rather than on the accuracy and relevancy of each particular listing since it will not be known with certainty until after the Congress whether any one of the items listed is relevant or not.

PROPOSAL: In subdivision (2) delete:

"52 or 54"

and substitute:

"51, 52, 53, 54, or 55"

also delete subdivisions (3), (4) and (5) and substitute as follows:

"(3) If it is a later homonym (see Art. 30, 61, 70).

"(4) If it is a *nomen ambiguum* (see Art. 62), or a *nomen dubium* (see Art. 63), or a *nomen confusum* (see Art. 64), or if it is based on a monstrosity (see Art. 65).

"(5) If it is a generic name which is contrary to Art. 25 or which must be rejected under Art. 67.

"(6) If it is a specific epithet contrary to Art. 27 or which must be rejected under Art. 68.

"(7) If it is a subdivisional epithet which is contrary to Art. 28 or which must be rejected under Art. 30, 61 bis or 68.

"(8) If it is a name of a subdivision of a genus which is contrary to Art. 24, 26 or 53.

"(9) If it is a name of a group above the rank of genus which name is contrary to Art. 23 or 66.

"(10) If it is a name of a hybrid which is contrary to Art. 31, 32, 33 or 34.

"(11) If it is a name of a Fungus which is contrary to Art. 57.

"(12) If in general it is contrary to Art. 13, 18, 50, 56, 58, 59 and 65 bis."

ARGUMENT: This new enumeration will have the obvious advantage of making it easier to find the relevant information whenever it is necessary to check on the legitimacy of a name and, because the list will be complete, the present ambiguity in Art. 60 will disappear.

Art. 60 bis (or 60)

COMMENT: Should the example re *Seseli* that now appears under subdivision (2) or Art. 60 be retained, I would like to submit the following:

PROPOSAL: Under subdivision (2) delete the last sentence of the Examples, that is the sentence that begins as follows:

"As circumscribed by Jacquin,. . ."

ARGUMENT: This sentence introduced a consideration of "mutual exclusiveness" that is not defined and does not appear elsewhere in the Rules. It seems to me that *Seseli selinoides* Jacquin is not illegitimate simply because it is nomenclaturally distinct from *Peucedanum Silaus* L., although both are now considered as synonyms on taxonomic grounds. The consideration of "Mutual exclusiveness" is perhaps accurate, but it is at least superfluous and susceptible of creating confusion by the introduction of an irrelevant consideration.

Art. 61 bis

PROPOSAL: Insert the following new article:

"**Art. 61 bis.** A name of a taxonomic group is treated as illegitimate if it was published with alternative ranks. A name of a subdivision of a species is treated as illegitimate if its rank is not clearly stated.

"Examples: Alternative ranks: *Antennaria parvifolia* Nuttall var. or f. *rosea* Greene, *Athyrium Filis-femina* f. or var. *rubellum* Gilbert. Undetermined rank: *Thalictrum thyrsoideum sylvanum* Lunnell".

ARGUMENT: This appears to be at present the commonly accepted procedure amongst botanists and it seems to be the only one that does not lead to confusion. Of course such names although illegitimate are always available for transfer to a definite rank provided of course that there are no obstacles to their use in the new position or sense. (Vide Art. 69).

Art. 64

PROPOSAL: Delete the word "especially" and add the following note:

"Note: For nomenclatural purposes, Lichens are treated as individuals."

ARGUMENT: Only when one reads the examples given under this article does the intent of its authors become obvious. The text of the Rule itself is not quite definite enough. The expression "Entirely discordant elements" is not defined and is susceptible of a variety of interpretations. And Art. 64 could also be literally interpreted to render illegitimate all the nomenclature of Lichens. It could also be interpreted to render illegitimate any kind of name based on more or less heterogeneous type material.

The present proposal is probably not quite sufficient to eliminate all ambiguity from Art. 64, but it does at least eliminate some of the ambiguity by restricting its meaning somewhat and making it clear that it does not apply to Lichens.

Art. 65

PROPOSAL: Add the following note:

"Note. If it is found useful or desirable to name monstrosities and to use names and epithets based on monstrosities, the use of such names must then be restricted to the monstrosities themselves and these names have no priority over names based on normal plants."

ARGUMENT: Although Art. 65 has been with us for quite some time, the current literature contains an appreciable proportion of new names, usually forms, based on monstrosities such as double-flowered specimens, proliferous plants, etc. It seems therefore that Art. 65 goes too far in rejecting those names entirely, with the result that a large proportion of botanists actually disregard it. The present amendment would permit the use of such names, but *sensu stricto* only. Thus these names would be available to designate monstrosities and nothing else. This, I believe, is what most of them were originally intended for anyway.

Art. 65 bis

PROPOSAL: Insert the following new article:

"Art. 65 bis. A name of a taxonomic group must be rejected if it is not ultimately based on actual plants or specimens, even though the existence of such a group is possible or probable.

"Example: *Equisetum sylvaticum* L. var. *pauciramosum* Milde f. *neoserotinum* Vict. must be rejected because at the time it was described the describer did not know that any such plant existed, even though he rightly supposed that it would certainly turn up if searched for diligently."

ARGUMENT: Victorin described as f. *neoserotinum* of *Equisetum arvense* a variation with the smooth branches characteristic of the American var. *pauciramosum* but not *dimorphous*, the fertile shoot being branched in the manner characteristic of the sterile shoot. This plant was described by analogy with *Equisetum sylvaticum* L. f. *serotinum* Milde. Victorin's assumption that a similar variation would also occur in var. *pauciramosum* was undoubtedly sound. By similar reasoning, one could describe any number of

albino forms, especially of blue-flowered species, any number of hybrids between closely related species, etc. But this is a highly objectionable procedure. The task of a taxonomist is already difficult enough when he is working with type specimens and descriptions drawn from actual plant specimens. The rules should discourage anybody from describing a plant not yet known to exist.

Art. 68

COMMENT: If Art. 30 bis is adopted, it will become necessary to render illegitimate all names of subdivisions of species when they are words intended to designate the typical phase of a species or subdivision of a species such as *typicus, genuinus, verus, originalis,* etc. I understand that this point has already been taken care of at the Utrecht Symposium.[3]

Art. 68

PROPOSAL: After "Specific epithets" insert:

"and names of subdivisions of species"

ARGUMENT: This Art. 60 is commonly interpreted to affect not only specific epithets, but also names of subspecies, varieties, forms, etc., and the present proposal would only codify and legitimize present usage.

Art. 69

PROPOSAL: Delete the last sentence of the examples, the one that begins as follows: "This is treated, ..." and substitute:

"The latter must be retained as there is no obstacle to its use under the genus *Calandrinia.*"

ARGUMENT: Art. 69 states that: where a new epithet is required, an author may, if he wishes, adopt an epithet previously given to the group in an illegitimate combination. It seems according to this rule that the illegitimate epithet of *Talinum polyandrum* Hooker could be transferred to *Calandrinia* provided there was no obstacle to its employment in the new position. If *Calandrinia polyandra* Bentham is to be considered as a new name, then the previously published *Talinum polyandrum* Hooker was not adopted and the example does not fit the rule and should be deleted or replaced by a more suitable one.

Art. 70

COMMENT: Under the examples of unintentional orthographic errors the following appear: *Gluta renghas* and *Gluta benghas.* To conform with recommendation XL, both specific names should have a capital initial letter.

Art. 70

PROPOSAL: Under "Examples of orthographic variants" delete the following:

"each of them has been spelt by subsequent authors both as *"Bradleia"* and *"Bradleya"* and"

ARGUMENT: This "a posteriori" consideration does not appear elsewhere in the rules, it is unnecessary and confusing. We cannot leave our present day nomenclature at mercy of future spelling mistakes, for who can foresee what spelling mistakes are going to be made in the next hundred years and how these are going to affect our present day nomenclature?

See also in the "Ballots" Dr. H. A. St. John's proposal to revamp the series of examples under Art. 70. This proposal was however rejected.

Rec. XXXIX (c)

PROPOSAL: After "become generally *e*", add the following:

"or sometimes *ae* when necessary in order to retain the accent in its original position."

ARGUMENT: Names such as *Piché, Bouché, André,* are accented on the second syllable *(é).* If latinized as recommended in Rec. XXXIX they become *Pichea, Bouchea,* and *Andrea,* and the accent is shifted back one syllable. To retain the accent in its original position, it is necessary to change *é* to *ae* as follows: *Picháea, Boucháea, Andráea.* In french words of latin origin the letter *é* frequently stands for a latin *ae.*

Rec. XXXIX (e)

PROPOSAL: Add the following:

"(e) When a new name is taken from the name of a person for which a latin form exists, the new name may be derived from the latin form.

"EXAMPLE: *Sarracenia* L., from *sarracenus,* after Michel Sarrazin 1659-1739.

ARGUMENT: Quite a number of generic names were created in this manner, especially by the earlier botanists.

Rec. XL (e)

PROPOSAL: Add the following:

"(e) If a specific or other epithet comes from a man's name for which a latin from already exists, this latin form may be used.

Examples: *Caroli* (Charles), *Johannis* (John, Jean)".

[3] Through the courtesy of Dr. E. D. Merrill, I have just would now be desirable to effect many minor changes in the present text, such as substituting "taxon" for group but as the present article is ahead in proof, it seems preferable to entrust this task to the editors of the next text of our International Rules..

ARGUMENT: This is common practice and should be codified in its proper place along with the other methods of forming epithets from a man's name.

Rec. XL (f)

PROPOSAL: Add the following:

"(f) If a specific or other epithet comes from a man's name which happens to end like a typical latin word, this name may be treated as if it were already a latin word.

"Examples: *Balansae* (from Balansa), *Olgae* (from Olga), *Hookeri* (from Hooker), *Turneri* (from Turner), *Chiaonis* (from Chiao)".

ARGUMENT: This is common practice and some of the examples given were taken from elsewhere in the Rules.

Rec. XLI bis.

PROPOSAL: Add the following Recommendation after Rec. XLI.

"XLI bis. Epithets taken from place names are preferably adjectives and usually take the terminations *—ensis,* or *—(a)nus,* or *—icus.*

"Examples: *Rubus quebecensis* Bailey (from Québec), *Ostrya virginiana* (Miller) W. (from Virginia); *Polygonum pensylvanicum* L. (from Pennsylvania)".

ARGUMENT: The adjectival form for epithets derived from place names is more in accordance with Latin usage than the genitive form. The adjectival form is also the one most frequently used by botanists when forming such epithets.

Rec. XLII

COMMENT: In the "Ballots", Dr. F. R. Fosberg advances a proposal to delete the second part of this recommendation, stating: "The two parts of this recommendation seem mutually contradictory. In many cases if the names are spelled in conformity with the original spelling of the words they are taken from, they cannot be in accordance with the rules of Latin and latinization."

Fosberg has a good point there; the two parts of Rec. XLII are, in part, contradictory and the examples given were improperly selected. Deleting the second half of the Rec. XLII seems however a bit drastic. The following proposal is advanced instead:

PROPOSAL: Delete "in accordance with" and substitute:

"with due regard to"

Also delete the examples.

Seconded by D. B. O. Savile

ARGUMENT: Same argument as Fosberg's. The examples do not seem quite relevant. I do not know that *silvestris* is any better latin than *sylvestris,* and while *sinensis* is better latin, *chinensis* is the kind of adjective that could be formed from China or Chine if the original spelling is retained as recommended.

Rec. XLIV

PROPOSAL: Add the following paragraph:

"Compound words shall be written as one word and not with a hyphen joining their component parts, even if originally spelt with an hyphen.

"Examples: *atriformis* (and not *atri-formis), longepedunculata* (and not *longe-pedunculata), Euequisetum* (and not *Eu-Equisetum), Carex albonigra* (and not *Carex albo-nigra),* but the following which are not compound words but groups of words used as epithets, are correctly hyphenated: *Veronica Anagallis-aquatica, Betula terrae-novae, Aster novi-belgii, Impatiens Noli-tangere.* (Vide Art. 27)".

ARGUMENT: Looking up old descriptions I have occasionally found that epithets currently written as one word were originally hyphenated. In many languages, and especially in french and in english, it is a common tendency for new words to be at first hyphenated and later to come to be written as one word. It seems that this has also happened to some extent to our botanical latin.

The present proposal would legitimize and standardize this practice.

Art. 73 (1)

PROPOSAL: Add the following:

"All such "opinions" must be published to take effect. They are susceptible of being invalidated by a subsequent "opinion",or by a following Botanical Congress."

ARGUMENT: It is generally recognized that judicial power includes some degree of legislative power in so far as any judicial opinion sets a pattern for similar cases. Therefore they should be made public and the International Botanical Congresses should retain the privilege of invalidating them. It does not seem necessary that the Congress should express its opinion on each one of these particular cases. Such a procedure would tend to overload the schedule of a congress with too many votes on individual cases.

Appendix IV

PROPOSAL: Start the list with the two exemples given under Art. 62 (*Alsine* L. and *Rosa villosa* L.)

ARGUMENT: Unless some names are listed in Appendix IV, both this Appendix and Art. 62 remain pointless and should be discarded as so much deadwood. It seems that at least the two examples given, because they have been approved by past Congresses, should be accepted as "*nomina ambigua*" without difficulty.

Appendix V

PROPOSAL: Start the list with the two exemples given under Art. 64 (*Schrebera* L. and *Actinocotinus* Oliv.).

ARGUMENT: The names to be rejected under Art. 64 are to form Appendix V but no name is listed at present under App. V, and Art. 64 is thus somewhat pointless. It seems that either Appendix V should list at least the two examples given under Art. 64 or else both Appendix V and Art. 64 should be deleted because they are useless.

SUPPLEMENT

Species lectotypicae generum Linnaei

PROPOSAL: For "*Thalictrum aquilegiifolium* substitute:

"*Thalictrum foetidum*"

ARGUMENT: See Rhodora 46: 347. 1944. The earliest proposal of a type species for *Thalictrum* is that of *Thalictrum foetidum* by Britton & Brown, Ill. Fl. 2: 118. 1913. This seems to be a happy choice since *T. foetidum* is quite a characteristic species of the genus as a whole and it has never been transferred to any of the various segregate genera proposed by one or the other of those authors who thought that *Thalictrum* should be divided in two or more genera.

Thalictrum aquilegiifolium has a rather unusual triangular, 4-winged, and 4-nerved fruit; it has been repeatedly segregated from *Thalictrum* to form sometimes a monotypic genus, or else into a small segregate genus: *Physocarpum, Tripetrium, Ruprechtia.*

Supp. Sp. Lectotyp. Linn.

PROPOSAL: delete the following:

"Alsine media"

ARGUMENT: Under Art. 62, *Alsine* is given as a characteristic example of a nomen ambiguum. If *Alsine* should be typified by *A. media,* it should not then be considered as a nomen ambiguum or vice versa.

APPARENT OBSERVATIONS OF THE WHOOPING CRANE IN CENTRAL SASKATCHEWAN[1]

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ON May 22, 1947 Walter A. Tholen of Battle Creek, Michigan, and the author started to aid in the search of the almost extinct whooping crane, *Grus americana* (Linnaeus), in central Saskatchewan in cooperation with Robert P. Allen working for the National Audubon Society and Robert Smith with the Fish and Wildlife Service. On our arrival at Yorkton, we hired a pilot, Austin Ingham and his Piper Supercruiser and worked for several days over the regions north and west of there. We flew over Quill Lakes, over Last Mountain Lake then back to Yorkton on May 27 then on May 28, 29, and 30 north to Nipawin, then as far north as Big Sandy and Deschambault Lakes and as far west as Candle Lake, returning in the evening of May 30 to Yorkton. A train trip the following day brought us back to Nipawin where we spent the early part of June, going north to Fishing Lake by truck June 6. Here we remained until June 12. June 14 and 15 and part of June 16 were spent in the Snowden area where a good many miles were covered by foot. Then I returned to Prince Albert in the afternoon of June 16 and in the evening Walter Tholen and I flew with Bob McClelland over Birch Bark Lake to this same Snowden area where some good whooping crane reports had been made. We left for home June 17 having seen no whooping cranes.

However, the visits with many natives that we had, produced many apparent reliable reports, most of them during the past few

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years. These reports are here presented as they were given to us with the reasons that we accepted them. Many other reports were evidently mistakes in identification, most of them pertaining to the white pelican *(Pelecanus erythrorhynchos)*, to the whistling swan *(Cygnus columbianus)*, or to the sandhill crane *(Grus canadensis)*.

1. *Mozart* (32N-15West of 2). One large black-wing-tipped, white crane with large flock of sandhill cranes October 5, 1942. Reported by Dean Lightbody of Yorkton who knew sandhill cranes very well.

2. *Saltcoats* (T25N, R3W2). Large white bird with black wing tips flying over farm land very near the ground. It had a loud bugling call much like that of the sandhill cranes that remain in the nearby Rockeby Marshes only two miles or less away. Reported by farmer boy, Walter Domon. Observed May, 1946.

3. *Nipawin* (Sect.8,T51N,R15W2). Reported and verified by Maurice Street of Nipawin. Two farmers observed at the same time (May 3, 1947) four white cranes with black wing tips in their old wheat stubble field across the Saskatchewan River from Nipawin. Neither man had ever seen white cranes before. Maurice Street (Blue Jay, 1946, p. 45) had published the following reports from the Nipawin area:

"C. Stuart Francis, noted one lone bird May 10, 1944. W. G. Karstad saw 7 whooping cranes flying in a northerly direction, May 13, 1944 at Pontrilas. Three seen almost daily from April 29 to June 13, 1945, in the vicinity of Campbell Lake by John Lyons and Joe Wark."

Maurice Street (verbal) said that he had also observed these birds at the Campbell Lake area during the 1945 summer on more than one occasion. They often fed on the grain fields near the marsh. Sandhill cranes usually have their young out of the nest by this date in Alberta and it is certainly possible that they might have nested there and then have been flooded out by terrific rains that came in mid-June, 1945. After June 13 they were not seen.

4. *Choiceland* (Sect.2, T52N, R18W2). Observed one large white bird with black wing tips May 28, 1947, feeding on his newly-planted wheat field. Observed by Clarence Veith.

5. *Weirdale* (T52N, R22W2 and 5½ miles directly north of Weirdale). Three large white birds feeding on an open field on two different days near his home and near a dirt road that passed by there. The birds had black wing tips and flew with both feet and neck straight out, plainly visible. They had loud bugle-like calls. One bird had some reddish-brown on the back of the head and on upper neck. Observed by Gilbert Newman May 14 and May 15, 1947. I could find no flaws in his report even when cross-examined closely. He did not know that family groups of cranes often travel in spring in threes nor that the young have the reddish-brown on the back of the neck and head.

6. *Snowden* (T53N, R18 and 19W). The first report came from Game Guardian, Harold Read, with the Department of Natural Resources in Saskatchewan. He lives in the neighborhood and had had these reports continually, in recent years. The area was so dry during 1947 that nearly all of the marshes were dry. I covered by foot the regions in sections 1, 2, 3, 4, 9, 10, 11, 12, 14, 15, 16, 21, and 22 in T53, R19W2 and sections 6 and vicinity T53, R18W2 but saw no whooping cranes nor apparent signs June 14, 15, and 16. I had gone over the same area on May 30 by air and went over it again June 16 about 7 p.m. [I found sandhill cranes: Two on June 14 (Sect.1, T52N, R18W2) (flying into Sect.6, T53N, R18W2) and two apparently with young (Section 9, T53N, R19W2) June 14, 1947, then two on June 16 (Section 14, T53N, R19W2).]

The following records most certainly pertain to the whooping crane: Alfred and Ernest Johnston saw one whooping (white) crane during early June, 1942 (Sect.6, T53N, R18W2). Garth Harrison saw one (as white as snow) about mid-June, 1946 (Sect.6, T53N, R18W2). White cranes were reported also by one or more farmers in the same neighborhood during the summers of 1943, 1944, 1945, and 1946. Dr. Jack Carson, a retired veterinarian, living in section 3 (T53N, R19W2) about 4 miles northwest of Snowden had one pair of whooping cranes (as well as sandhill cranes) back of his house during the entire summer of 1946. Two others were seen at another time in migration in the same area so that four were under observation at once. He stated that neither pair would tolerate the approach of the other pair, driving them away so that some distance always separated them.

The pair that remained during the summer came daily to a small marsh to drink, flying in just over the tree tops. Then they remained to preen.

Dr. Carson, not knowing the habits of the whooping crane, certainly must have seen them during the 1946 summer. The habits he described were beyond a doubt those of this species. He also knew the sandhill crane very well, having them within sight or sound during each summer day. Too many people in this vicinity had seen white cranes to have records of anything but whooping cranes but I must have walked over 40 miles during my stay there and flew over the area twice during 1947 but none was seen. None of the residents there reported whooping cranes during 1947 except one whose report was quite questionable.

A NEW ANTENNARIA FROM NORTHERN UNGAVA [1]

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FOR SOME YEARS Dr. Jacques Rousseau, Director of Montreal Botanical Garden, Montreal, Que., has been engaged in a study of the flora of Ungava. In 1944, 1945 and 1946, with Dr. Ernest Rouleau, he explored the Lake Mistassini region; in the summer of 1947 he descended the George River from Lake Michikamau to Ungava Bay, and in 1948 crossed from Payne Bay on the west coast of Ungava Bay by way of Payne and Kogaluk Rivers to Povungnituk on the east coast of Hudson Bay.

Among the plants collected in 1947 and 1948 is a fine series of *Antennaria* which it has been my privilege to study. I was particularly pleased to find among them new material from several stations of the little known *Antennaria ungavensis* besides an exceptionally fine series of a rather remarkable new species the existence of which I have suspected for some time, but lacking sufficient material, previously referred to *A. isolepis.*

Antennaria Rousseaui n. sp. Plate I. Figs. 1-5.

Rhizoma suffrutescens sat ramosum. Stolones procumbentes 3-8 cm longi foliis oblanceolato-spatulatis, apice distincte et prominenter mucronatis, 15-20 mm longis, 3-4 mm latis, sub tomento obscure trinerviis, utrimque tomento tenuiter cinereo-lutescente praeditis. Caulis florifer 20-25 cm altus gracilis plus minusve arcuatus eglandulosus prominenter floccoso-lanatus. Folia 8-10 utrimque tenuiter tomentosa, inferiora oblanceolata mucronata 2 cm longa superiora linearia multo minora apicibus scariosis munita. Inflorescentia initio glomerata maturitate laxe cymosa calathiis femineis 3-7, pedunculis 5-20 mm longis. Involucrum ca. 6 mm altum bracteis 2 — vel 3 — seriatis laxe imbricatis oblongo-obtusis; exteriores basi obscuro-olivaceae tenuiter lanatae, interiores basi olivaceae apicibus firmis stramineo-chartaceis maturitate valde reflexis. Corolla purpurea, stylus vix exsertus. Achaenia olivacea valde papillosa. Pappus niveus. Planta mascula ignota.

Antennaria Rousseaui belongs in the section *Dioicae* and undoubtedly is rather closely related to *A. isolepis* Greene, from which it differs by its taller growth, longer stolons bearing larger and more numerous leaves, the absence of glands on the flowering stems and peduncles, by its firm, papery and obtuse inner phyllaries, and by its strongly papillose achenes.

Antennaria isolepis Greene was described from an over-mature collection from Eskimo Point on the west coast of Hudson Bay (J. M. Macoun, Can. 79270). By subsequent students of boreal species of *Antennaria* (Fernald, Malte, Porsild and Polunin) its range has been extended from the east coast of Labrador to central Alaska. Fernald, Rhodora 26: 102 (1924) pointed out that in the eastern population of *A. isolepis* the achenes are "sparingly papillose" whereas the writer has shown that in the western plant the achenes agree with those of the type which are perfectly glabrous. Since small specimens of *A. Rousseaui* in habit strongly simulate *A. isolepis,* Fernald's observation may perhaps have been based upon such small specimens of *A. Rousseaui.* At any rate a number of sheets in the Gray Herbarium determined as *A. isolepis* clearly belong to *A. Rousseaui.*

[1] Received for publication March 1, 1949.

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Plate I. ANTENNARIA ROUSSEAUI n. sp.: Fig. 1 and 2, fruiting plants, X 3/7; both from TYPE (Payne R., Ungava); Fig. 3 and 4, young fruiting plants, X 3/7, from George R., Ungava, Rousseau Nos. 648 & 265; Fig. 5, X 3/7, from Lake Taserkulu on Kugaluk R., Rousseau No. 535.

ANTENNARIA UNGAVENSIS (Fernald) Malte: Fig. 6 and 7, overmature fruiting plants, X 3/7, both from TYPE (Spreadborough, Still water R. Labrador, Can. 44,442).

This new and very handsome species is named for Dr. Jacques Rousseau, Director of the Montreal Botanical Garden who, in 1947 and 1948, collected large series of it in northern Ungava.

During the seasons of 1947 and 1948 Dr. Rousseau made the following collection of *A. Rousseaui:*

(1) *Payne and Kogaluk Rivers, 1948*

Rivière Payne, vers 59° 17' lat. N.: terrasse sablonneuse, 7 août 1948, No. 991 (TYPE, in Nat. Herb. of Canada); same place and date, sur une berge graveleuse, No. 983; Rivière Payne, vers 72° 53' long. W.: berge sablonneuse, No. 968; Lac Payne, dans l'étranglement central, vers 73° 55' long. W. et lat. 59° 28' N., sur la grève gneissique, No. 862; Lac Tashwak, à la source de la rivière Kogaluk, No. 614; lac Annaktolik, élargissement de la R. Kogaluk, No. 508; Lac Taserkulo, près du dix-neuvième portage de la Kogaluk, No. 535;

(2) *George R., 1947.*

Anse du Ruisseau Thicasq, vers 55° 31' lat. N., No. 301; Rivière George, vers 55° 28' lat. N., No. 265; Rivière George, vers 56° 51' lat. N., No. 648; près Hades Hills, vers 56° 58' lat. N., No. 684; same place, vers 57° 7' lat. N., No. 743; en face des Monts Bridgeman, vers 57° 52' lat. N., No. 912.

In addition to the series listed above there are in the National Herbarium of Canada the following specimens of *A. Rousseaui:*

Labrador: Okkak, near Cut-Throat Tickle, 57° 40', Aug. 13, 1937, V.C. Wynne-Edwards, No. 7496; Cape Harrigan, upland marsh, 55° 50' lat. N., Harlow Bishop, No. 592; East Coast of Hudson Bay: Richmond Gulf, Dutilly and Lepage, No. 13283; Great Whale R., Dutilly and Lepage, No. 12900; same place, Baldwin, Hustich, Kucyniak and Tuomikoski, No. 1105.

A. isolepis Greene in Ottawa Nat. 25:41 (1911).

Près de la onzième chute de la R. Kogaluk, No. 462; près de la neuvième chute de la R. Kogaluk, No. 409b.

Both collections are small and scrappy and may be poorly developed specimens of *A. Rousseaui* (see discussion of that species).

A. ungavensis (Fern.) Malte in Rhod. 36:110 (1934). Plate I, Figs. 6-7.

A. alpina (L.) Gaertn. var. *ungavensis* Fern. in Rhod. 18:238 (1916). Fort Chimo, No. 44; Lac Payne, vers 73° 55' long. W., No. 863; Portage entre le lac Tashwak et le lac Payne, No. 690; Lac Annaktolik, élargissement de la rivière Kogaluk, No. 508b.; près de la huitième chute de la R. Kogaluk, No. 387; près de la neuvième chute de la R. Kogaluk, No. 409a; première chute de la Kogaluk, Nos. 279b and 280.

Antennaria ungavensis of the section *Alpinae*, one of the rarest of the eastern arctic members of the genus, long known only from the type collection: Stillwater River, Labrador, Aug. 12, 1896, Spreadborough (Can. 44442), apparently is well marked by its oblanceolate and mucronate basal leaves which even in youth are glabrous above, by its tufted growth (although short leafy stolons are formed) and by its few, often long-peduncled (Malte's "pseudopleiocephalic") inflorescence. The specimens in the present series are only half as tall as the 22-25 cm, high type and are a close match for a collection from Port Harrison, Polunin No. 1730 (Can.).

A. canescens (Lge.) Malte in Rhodora 36: 109 (1934).

Baie Kayak, dans l'estuaire de la B. Payne, No. 1470; R. Payne, vers 73° long. W., No. 953; R. Payne, vers 59° 17' lat. N., No. 983a; Lac Taserkulu, élargissement de la R. Kogaluk, No. 535a; Lac Annaktolik, élargissement de la R. Kogaluk, No. 508a; près de la neuvième chute de la R. Kogaluk, No. 409; près de la onzième chute de la R. Kogaluk, No. 462a; première chute de la Kogaluk, No. 279; Povungnituk, rive est de la B. d'Hudson, No. 115a.

The numbers cited above are all typical *A. canescens.*

A. angustata Greene in Pittonia 3:284 (1898).

Poste de Payne Bay, vers 70° 1' long. W., Nos. 1255, 1277 and 1408; R. Payne, vers 70° 3' long. W., No. 1197; R. Payne, vers 70° 17' long. W., No. 1177; Lac Taserkulu, élargissement de la R. Kogaluk, No. 537; près de la treizième chute de la R. Kogaluk, No. 487; près de la troisième chute de la R. Kogaluk, No. 338; première chute de la Kogaluk, Nos. 279a, 280a, and 291; Poste de Povungnituk, rive est de la baie d'Hudson, Nos. 115 and 163.

Antennaria angustata, like *A. canescens* appears to be a common and wide spread species in northern Ungava where it frequents slopes and depressions where the snow remains until late in the season. It is strange that Dr. Rousseau collected neither *A. canescens* nor *A. angustata* in 1947 on the George River.

SALIX PETIOLARIS J. E. SMITH IN THE EDMONTON DISTRICT OF ALBERTA [1]

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DURING 1947, I have had much interest and pleasure in the study of this willow in the field, more particularly in the vicinity of Fort Saskatchewan, which is 14 miles northeast of Edmonton. The study, however, has covered the general Edmonton area, as far northeast as Smoky Lake, east to the eastern boundary of Elk Island Park 20 miles east of Fort Saskatchewan, and southwest to Pigeon Lake, 65 miles southwest of Edmonton.

Salix petiolaris is one of the commonest willows in this area and probably is relatively more abundant than when the country was settled, as it seems to be better able than any other willow to recover after being cut down and to reoccupy land which has been cleared and then left open for re-occupation.

It is not abundant along the river banks or on the river flood-plains but plentiful on our uplands, along creeks and around ponds and sloughs and in depressions. It flourishes also here and there along roadsides, road ditches, and fence lines all over this territory, even on our highest ground, such as that of Beaver Hills and Partridge Hills.

When it grows thus on open ground, it always is a many-stemmed shrub, averaging 10-12 feet in height when adult. The stems are relatively slender and 40-50 or more stems in a clump are common. The majority of the stems are 1 inch or less in diameter but in the average adult shrub some are 2 inches, with an occasional stem in the largest plants reaching 4 inches in diameter near the ground. Such large stems are likely to branch fairly near the ground.

Height varies with age and location. Shrubs 15 feet high are common and many are higher. One at Black Mud Creek, 10 miles south of Edmonton, was 17½ feet high and another near a small slough on the eastern edge of Ft. Saskatchewan measured 22 feet 4 inches in height. It had 20 stems, one 4 inches in diameter one foot above the ground. A second shrub there was 20 feet high and many others in the colony were not far short of 20 feet. The willows bordering this slough seem never to have been cut down and many of them probably are fully adult.

Salix petiolaris frequently is found in nearly pure stands on low ground, in bits of meadow along creek banks or around ponds, even under natural conditions. It often occurs in completely pure stands in such places if they have been cleared and then allowed to make what recovery they could. This is particularly likely to happen in permanent pastures. Around one such pasture pond 3 miles southeast of Fort Saskatchewan, the willows had been entirely cut down about 20 years ago and animals pastured thereon. Now the pond is surrounded by a thick growth of willows, in which a careful examination failed to find a single shrub other than *S. petiolaris*. Most of these willows were about 12 feet high, with perhaps 10 per cent reaching 15 feet or a little more. On a motor trip from Fort Saskatchewan to Edmonton and south to Wetaskiwin, a distance of about 65 miles, ten or twelve such pasture ponds were observed, all bordered by *S. petiolaris* in pure or very nearly pure stands.

S. petiolaris is found sparingly in aspen woods on the black-soil uplands in the Edmonton area, especially in depressions in such woods, and then it often is quite different from its usual form on open ground. The stems are fewer in number, perhaps as many as 20 sometimes only 3 or 4, and occasionally only one, the plant then being a small tree in appearance. In a small aspen wood of 3 or 4 acres, on the corner of the Fair Grounds in Fort Saskatchewan, 9 such small trees of this species were found. Three are shown in Fig. 1. They are 11 feet to 11 feet 2 inches in height, with stems an inch or slightly less in diameter.

The many-stemmed, very slender shrubs of this species, so common in many places here, and of lesser height than those discussed above, usually are young willows which have been making very rapid growth, often more than 2 feet a year. These are the "Basket Willows" along our roadsides or elsewhere.

The color of the twigs of *S. petiolaris* has interested many botanists. Thee colors of 1-year and 2-year twigs are found to vary greatly, even on the same shrub. They vary from yellow to red or brown but usually are mainly of one of these colors on a given

1. Received for publication September 13, 1947; amended in 1948.

Fig. 1. Three small tree-like specimens of SALIX PETIOLARIS.

shrub. Whether the 1-year twig be yellow, red, or brown, the 2-year twig generally will be a darker yellow, red, or brown. It is common to find both 1-year and 2-year twigs yellow on the shaded side and red or brown on the side exposed to the sun. It is not known why one shrub in any given habitat should have yellow twigs and another in the same habitat should have red or brown twigs. One of the yellowest of such willows seen was growing in the open sunlight only 6 feet from another of equal thriftiness but with beautifully red twigs. These were young willows making very rapid growth of more than 2 feet each during 1946. The natural colors of these twigs rarely are preserved in the dried specimens.

From the time new growth started on *S. petiolaris* in the spring of 1947, continued watch was kept on the color of seasonal twigs. They remained uniformly and invariably pale green through the spring and early summer. By the last week in July, they began to show a pale yellow color. By August 7, many of them were yellow on the shaded side and brown on the side facing the sun.

On August 30, 1947, records were made of the colors of seasonal, 1-year, and 2-year twigs on 32 plants of *S. petiolaris* located one half mile south of Fort Saskatchewan. The results are tabulated below. Where two colors are given for a single twig, the color of the shaded surface is given first and that of the sunned surface last, thus showing seasonal progress. It was not uncommon to find different color combinations on two different branches or stems of the same plant.

No.	*Twigs*		
	Seasonal	*1-year*	*2-year*
1.	yellow	brown	brown
2.	yellow	yellow	yellow
3.	yellow-red	red	red
4.	yellow	brown	brown
5.	yellow	yellow	yellow
6.	yellow	red	red
7.	yellow	brown	brown
8.	yellow	yellow	yellow
9.	yellow	brown	brown
10.	yellow	red	red
11.	yellow	brown	brown
12.	yellow	brown	brown
13.	yellow-brown	brown	brown
14.	yellow	yellow	brown
15.	brown	brown	brown
16.	yellow	yellow	yellow
17.	green	brown	brown
18.	yellow	brown	brown
19.	green	brown	brown
20.	yellow	brown	brown
21.	yellow	yellow	yellow
22.	yellow	brown	brown
23.	yellow-brown	brown	brown
24.	green-brown	brown	brown
25.	yellow	brown	brown
26.	yellow	brown	brown
27.	yellow-brown	brown	brown
28.	yellow-red	red	red
29.	yellow-red	red	red
30.	brown	brown	brown
31.	yellow	yellow	yellow
32.	light-brown	brown	brown

Leaf size is an important character in describing plants. In willows, blade length seems to vary greatly on different kinds of growth, from fruiting shoots, to seasonal leafy twigs, to trunk and root sprouts. During mid-August, 1947, search was made for sprouts in the willow colonies around Fort Saskatchewan, in order to discover the maximum size of the blades produced.

Five collections had largest blades (excluding petioles) ranging from 4.5-5 inches long. A sixth collection had blades with maximum lengths of 5-5.5 inches and a seventh had some blades reaching a maximum of 6 inches. Smith recorded the length of blades on a sprout from a cut trunk as 4-5 inches, so his record has been exceeded here. It is probable that still larger blades may be found later in the season.

Seven collections of *Salix petiolaris* Smith were made by me on August 1, 1948, which had leaf-blades considerably larger than any I had previously collected. These were from vigorous sprouts from separate plants in the same willow colony at the edge of a small slough at Fort Saskatchewan, Alberta. The measurements of the largest leaves (in inches) were[2]:

6402a — 6 15/16 x 1 3/16
6402b — 6¾ x 1⅛
6402c — 6⅝ x 1⅛
6402d — 6¼ x 1⅛
6402e — 6⅛ x 1
6402f — 6⅛
6402g — 6 1/16 x 1⅞

2. I have had the pleasure and profit of reading the manuscript of this paper and commend Dr. Turner most highly for his tireless effort, keen observation, and carefully determined facts. More information of this kind is greatly needed, if we are to know our plants. It may be noted that the red color of the twigs of **S. petiolaris** occurs chiefly in the Great Plains Area, from Nebraska to Alberta. Elsewhere the sequence generally is green, yellow, and brown. Everywhere, the brown is likely to deepen as the season latens. In dried specimens, dark browns and near-blacks are common. Carleton R. Ball.

THE OCCURRENCE OF THE LEECH BATRACHOBDELLA PICTA (VERRILL) IN THE DORSAL SUB-CUTANEOUS LYMPH SPACES OF RANA CATESBIANA[1]

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ENDOPARASITISM is rare in the Hirudinea. There have been many accounts of the recovery of leeches, such as *Limnatis nilotica,* from the upper respiratory tract of mammals etc., but apart from these and similar records for other gnathobdellids, I have found no record of endoparasitism in the literature available to me. Accordingly, the initial discovery of a single leech in the dorsal sub-cutaneous lymph-space of a *Rana catesbiana* during routine dissection of the frog by students in the Zoology Department, McGill University, was viewed with suspicion and considered as probably the result of an accidental transference of the leech to this position during dissection; but the subsequent finding of two more leeches in the same site in a second *R.catesbiana* occurred when no such accident could have taken place and completely confirmed the previous case.

The second frog had not been opened when it came into my hands. It was placed in the prone position, the skin incised from the snout to the cloacal aperture and reflected to expose two leeches in the dorsal subcutaneous lymph-space. Examination of the skin, failed to show any indication of a perforation which could have served for the entry of these leeches at a time close to the death of the frog. The only indications were that the leeches had been some considerable period in the lymph-space.

The frogs were obtained from the vicinity of Mille Isles, P.Q. They been killed by chloroform, and preserved in formalin. About fifty frogs were dissected on this occasion, but only the two contained leeches. Over the course of several years, more than four hundred *R.catesbiana* have been dissected in the laboratory and in the field. No other case of endoparasitic infestation by leeches has come to my attention.

The method of preservation of the frogs did not give a good preservation of the leeches. When first seen, the leeches had the form of elongate tapering wrinkled cylinders rather resembling *Piscicola,* and were recognisable as leeches chiefly in the possession of a bulbous terminal sucker. The three specimens range in length from 10.2 mm. to 15.0 mm. In each case the cuticle was raised from the epidermis and the space between cuticle and epidermis packed with a whitish precipitated mucin-like substance. On removing the cuticle and washing away the deposit, the leeches are revealed as flattened glossiphonids of moderate size, having a lightly pigmented body which lacks elevated papillae. The body tissues have the peculiar transparency of *Theromyzon occidentalis,* but the leeches are quite distinct from that species since they possess a single pair of contiguous eyes. All three specimens are gorged with blood. The annuli are faint. The specimens are dull white, but there are brown and black chromatophores scattered through the epidermis.

The form of the body is peculiar. It is elongate, flattened, widest at segment xvi which is two-thirds from the anterior end, and tapers from xvi gradually to segment v; posterior to xvi, the body narrows rapidly from segment xx and so forms a short distinct narrow peduncle which supports a deep bowl-shaped circular caudal sucker. In the one extended specimen, this sucker is two-fifths of the width at segment xvi. This distinct peduncle and the shape of the sucker resembles the condition described for *P. pediculata;* but in this material, the anus is distinctly posterior to xxiv and the body gives no indication of the marked convexity and curvature of *pediculata.* The complete segments are triannulate. Segments i and ii are fused and overhang the anterior sucker. The mouth is situated in segment iii which is undivided and contains the one pair of contiguous pigmented eyes. Segment iv is biannulate and contains a narrow elongate triangular patch of aggregated pigment cells of the width of the eyes and extending from the anterior to the posterior margin of the segment.

[1] Received for publication December 9, 1947.

Segments v to xviii are clearly triannulate; but posterior to xviii, the annuli are not distinct. The male aperture is situated in xii a; the female, at xii a_2/a_3. Aggregations of light brown pigment cells form patches on either side of the mid-line and lateral groups on either side in the neural annuli of segments vii to xxiv. There are also groups of pigment cells on either side at a_3/a_1 between vi and xxiv. The median row, often present in these leeches, is represented only by a few patches of aggregated pigment cells on a_2 or a_3 of some segments, and is very incomplete. An indistinct white stripe extends across vi a_3 in the one specimen only. The caudal sucker bears twelve or more marginal patches of aggregated pigment cells. The reproductive system in all three specimens is developed, but not mature.

A description of these specimens was forwarded to Professor J. Percy Moore who has very kindly advised me that it is reasonably certain that they are of the species which he identifies as *Batrachobdella picta* (Verrill) formerly assigned to the Genus *Placobdella*. This is a species which has been inadequately defined in the North American literature. Although it has been recorded from many regions in eastern North America, the published descriptions are chiefly repetitions of, or extracts from, the original account set down by Verrill.

Until this identification by Professor Moore, I had considered that *B.picta* was represented in my collections by dark green, rather firm, elongate, essentially depressed leeches, recogniseable in the remarkably uniform width for the greater length of the body which narrowed sharply anteriorly to a short, shallow, essentially post-oral sucker; the eyes, a single contiguous pair situated in a white triangular area; the posterior sucker, attached centrally, and margined by pigment patches; the dorsum showing four (dorso-lateral, and lateral) rows of pigment patches on neural annuli, and obvious marginal intersegmental patches. This has been the basis of field records which I have published previously.

There is practically no published information on the food and habits of *B.picta*. It is commonly recorded from only a few specimens. These are free-living. The present account must be one of an exceptional habit since many *R.catesbiana* have come to dissection over the past thirty and more years and it is unlikely that such a strikingly obvious phenomenon could have completely been overlooked, or escaped description.

SQUIRREL CACHE OF FUNGI[1]

GEORGE A. HARDY
Provincial Museum, Victoria, B.C.

THE RED SQUIRREL'S partiality for mushrooms and other fungi is well known, likewise its habit of drying and storing them for future consumption. Dr. A. H. R. Buller in his "Researches on the Fungi" 2, 195-211 gives very full details concerning this habit of the red squirrel. He particularly emphasizes the fact that only in dry climates can such habits be practised owing to the perishable nature of fungi in damp weather.

As Dr. Buller's records are from eastern and central Canada, it is thought the factual notes from British Columbia might be of interest as a record from the extreme western part of the red squirrel's range where this mycophagus habit can be successfully employed.

Material and information have very generously been submitted to me by Mr. Harry C. Coppel, who was engaged in research work on Mt. McLean, Lillooet, B.C., during the summer of 1947. This district is about the western limit of the dry climatic conditions necessary for any prolonged preservation of fungi.

Among his collections was an interesting assortment of dried mushrooms and other fungi which he obtained from a red squirrel's

[1] Received for publication January 6, 1948.

cache in a stump of an old Douglas fir *(Pseudotsuga taxifolia)* around the 2,700 ft. level on the west ridge of Mt. McLean, Lillooet, B.C., on July 20, 1947.

The stump was well rotted and without bark, about ten feet high and two and a half feet in diameter. It had been burned and was very brittle. The interior was divided into eight irregular, connected compartments in which the fungi were stored. Two used openings in the stump led to this store one eighteen inches, and the other about seven feet above the ground, the higher was evidently used more frequently than the first.

Six of the compartments were completely filled, one partially and one, the uppermost, empty.

A study of the situation led to the surmise that the middle and lower sections were filled first from below, the upper cavities last and from above.

All the material was in a fine state of preservation, thoroughly dried and without any sign of insect or fungus damage. By actual count there were fifty-nine specimens, varying in size from half an inch to three inches across, the larger ones bearing scars on the stems apparently made by the rodent's teeth as they were conveyed to the storeroom. The combined bulk would have filled a gallon measure.

A remarkable feature of this collection is the variety of species and number of specimens gathered by the squirrel. Although it was impossible to designate all of them specifically, most of the genera could be identified. An attempt has been made to evaluate them by the following list, arranged approximately in classified sequence. The fact that only fungi were in this storehouse is noteworthy, for squirrels are well known to use other material for food, such as cones, nuts, etc., but these are usually stored underground.

Dr. Buller records as many as from two to three hundred specimens of dried fungi in one cache, and that the squirrel uses hollow trees, old woodpecker holes and disused bird's nests as store houses. He also notes that fungi constitute the sole contents of these arboreal larders.

Homobasidiomycetes

AGARICALES

Polyporaceae

1. *Fomes pinicola* (Sw.) Che. — one small specimen, about one inch in diameter evidently the first year's growth.
2. *Polysticus sp.* — one specimen. Related to *P. perennis.*

Boletaceae

3. *Boletinus pictus* Peck. — one specimen.

Agaricaceae

4. *Russula Mariae* Peck. — four specimens, all small.
5. *Russula adusta* Fr. — eight specimens.
6. *Russula alutacea* Fr. — four specimens.
7. *Lactarius piperatus* Fr. — four specimens.
8. *Tricholoma sp.* — one specimen.
9. *Clitocybe sp.* — one specimen.
10. *Inocybe sp.* — one specimen.
11. *Cortinarius sp.* — two specimens.

HYMENOGASTRALES

Hymenogastraceae

12. *Hymenogaster tener* Berk. — Thirty specimens, averaging about one half inch across. This species was by far the most numerous, and evidently in great favour by the squirrel. It is a ground-growing fungus not easily seen by the human collector.

LYCOPERDALES

Lycoperdaceae

13. *Lycoperdon pyriforme* Pers. — one large specimen.

Lichens

14. A piece of lichen-covered moss about two inches long and one inch broad. Evidently lichens form a portion of the diet of squirrels.

Summary

A squirrel cache of fungi was contained in a rotten, well ventilated stump. Only fungi were stored there. These numbered fifty-nine specimens of approximatley fourteen species, with *Hymenogaster* predominating and *Russula* next in importance. All were in an excellent state of preservation. Notes and material were provided by Harry C. Coppel, 1947.

PRESENT STATE OF THE CHESTNUT, CASTANEA DENTATA (Marsh.) Borkh., IN ONTARIO [1]

W. SHERWOOD FOX
London, Ontario.

IN THE UNITED STATES the revival of interest in the American sweet chestnut has turned the thoughts of many persons in southern Ontario to the present state of the tree in this region. In a recent issue of the magazine section of the New York Times the statement was made that by 1937 ninety-nine per cent of the chestnut trees in the United States had been killed by the fungus-blight, *Diaporthe parasitica*. Naturally, this prompts the Canadian reader to wonder how near to extinction the chestnut is in Ontario.

It is obvious that the great distance between Ontario and New York City, where the blight was first noted on this continent, caused a lag in the advance of the scourge westward. In 1937 there were still a host of fully grown chestnut trees in the Province which, despite varying degrees of infection, were bearing heavily each autumn. Now, it is only after the most patient search that one can scrape up even a scant handful of nuts. One cannot but ask: What is the true state of the chestnut in Ontario?

To answer the question we must first be sure we know the part of the Province in which the chestnut is indigenous. Its western, southern and eastern boundaries were clearly drawn by nature itself. Together they form one long and meandering but continuous line. This begins on the shore of prehistoric Lake Huron at a point which is now two or three miles inland from the mouth of the Aux Sables River at Port Franks in Lambton County. From there onward it coincides with the Canadian shore-line of southern Lake Huron, the St. Clair River, Lake St. Clair, the Detroit River, Lake Erie, the Niagara River and of Lake Ontario to the town of Oakville. The northern boundary is not nearly so definite, but now after many years of close observation botanists are able to draw it clearly. It is determined by the locations of the most northerly native stands of the chestnut. The eastern base of this boundary lies three or four miles to the north of Oakville at north latitude 43° 31'. Thence the line is traced westward to the following points: Puslinch Lake, Wellington County, 43° 25'; Branchton, Waterloo County, 43° 18'; Glen Morris, Brant County, 43° 16'; Lakeside, 43° 12', near St. Mary's, but in the extreme northwest corner of Oxford County; London, Middlesex County, 43° 00'; Thedford, Lambton County, 43° 11'. In all these places except the last, remnants of the chestnut are still found. The last record on Thedford is that of Macoun and Gibson published in 1875 in the old Canadian Journal. There they state that the chestnut then grew on the wooded banks of the now vanished Lake Burwell and on the hillsides bordering the lower Aux Sables River. A thorough search of that limited area would probably reveal a number of struggling chestnuts. For the apparent disappearance of the species here one is inclined to blame the human woodcutter rather than the blight.

The distribution of the chestnut in Ontario in relation to its northern limits conforms to the facts of its distribution in New England. Mathews (Field Book of American Trees and Shrubs, New York and London, p. 133) states that the species "is scarcely indigenous north of latitude 43° in New England, but it is frequent in the Merrimac valley south of Concord (N.H.), in Maine south of Portland, and in the Connecticut valley south of Windsor (Vermont). There is plainly an element in the nature of the chestnut which makes it very hard for it to hurdle the forty-third parallel, a fact which has a direct bearing upon plans to grow the pure native strain northward.

Of the chestnut population remaining in Ontario a few friends and I have made a rough estimate during the last four months of 1947. Through the press of southwestern Ontario we asked for information on such points as these: the exact situations of surviving stations of the chestnut and of individual trees bearing mature fruit this fall; how large and how old these trees were. A host of replies gave us an ample number of facts. Members of our group visited many places where fruiting trees were said to be.

1. Received for publication February 21, 1948.

Nowhere did we see or hear of a single old mature tree that is still alive and bearing. We were told of a large tree which had one stout bearing branch left in 1946, but this had been girdled by the fungus in the summer of 1947. Only one tree producing fully formed nuts did we ourselves see and of its entire crop we succeeded in rescuing no more than four nuts from the squirrels. This tree is near Fonthill in Welland County, has a height of about twenty feet and is already infected close to the ground. Nuts of three other trees were sent to us by mail. We received a report of a tree thirty-five feet tall and laden with burs; these upon examination turned out to be empty. This tree and all the others mentioned will be carefully inspected in 1948.

But what of the promise for the chestnut in its native region in Ontario? The facts regarding the present really give the answer. The conditions are the same throughout the region. Suckers are common everywhere, some bunched in clumps, some standing singly. Possibly some of these solitary specimens may be seedlings sprung from nuts planted by squirrels. These young trees range in height from one foot to ten feet, the dead and the living of all heights being about equal in number. It is clear then that the blight strikes as early as the plant's first two or three years. The vast majority are blasted before they reach six feet. Rare indeed is the one that exceeds twelve. So ubiquitous is the scourge that the odds against a chestnut escaping infection and attaining the size of a normal forest tree are overwhelming. That such a tree will ever be found again there is only the faintest ray of hope; this emanates from the fact that the oriental chestnut now being used on this continent in crosses with our native tree is itself a resistant survival of the blight in China. Faint as the hope is it is enough to fire our plant-hunters with the zeal to keep up their search.

The extinction of the native sweet chestnut has brought to a host of people in southern Ontario a regret that is akin to distress. This comes partly from a sense of economic loss, partly from a tender sentiment formed in childhood. Many are ready to incur expense on any project that promises to restore their lost tree. So the door is wide open for the racketeer to step on to the scene. And there he is already. This last autumn a large quantity of American chestnuts was imported, apparently from the State of Washington, and put on sale in southern Ontario. No claim was made that they possessed any special quality, such as that of being able to defy the blight. The price put upon them was fantastic — one dollar apiece! In a few hours the entire lot was sold. To get a vision of the profitableness of the transaction — for the seller — one need only make a rough guess of the return from a single quart. As for the buyer, his gain will come sooner or later in the form of a lesson rudely learned through the shattering of a fond hope.

Happily, the last word of this report is not one of unqualified despair: at least one cheerful note has been sounded. One correspondent tells us he knows a chestnut tree which is fully fifteen years old and which, still apparently intact, stands conspicuously among the gaunt skeletons of its defunct neighbors. May spring break early that we may go and see![2]

[2] When examined in May, 1947, this tree was found to be badly infected, its trunk of six inches being almost completely girdled.

A PUZZLING LABRADOR REFERENCE[1]

W. L. McATEE

Chicago, Illinois

IN THE COURSE of extensive consultation of publications on vertebrates of the nearctic region, finding the following reference[2] came as a challenge:

"1844. [Unknown.] Verzeichniss der in Labrador befindlichen Landsäugethiere und Vögel. Bullet. Akad. München, pp. 122, 129. Not seen — title from Giebel."

An unseen work by an unknown author! what more could a bibliographer ask? Inspection of papers on the fauna of Labrador by O. L. Austin, Jr. (Nuttall Orn. Club Memoir 7, 1932) and of Quebec by R. M. Anderson (Ann. Rep. Provancher Soc., 1938) indicated that the paper had maintained its elusive status. And no wonder; without the author's

[1] Received for publication April 5th, 1948.

[2] From Elliott Coues's excellent Bibliographical Appendix to "Birds of the Colorado Valley", 1878.

name, consulting the Catalogue of Scientific Literature is hopeless; and the periodical cited is so rare that only two complete sets are known in libraries of the United States and Canada according to the Union List of Serials (1943).

In attempting to borrow the proper volume of one of them, instead of the Bulletin, I received the Gelehrte Anzeigen in which, with the assistance of Walter Necker, at least a related article was found, but it had the appearance of an abstract. An annotated citation is:

von Schubert, Hofrath.

Correspondenz-Nachrichten aus Labrador. Gelehrte Anzeigen herausgegeben von Mitgliedern der K. bayer. Akademie der Wissenchaften [München].

[1] b) Verzeichnisz der in Labrador Befindlichen Landsäugethiere. Nro. 52, 13 März, 1844, columns 418-421.

Notes on 21 groups under their Eskimo names.

The articles on birds have no letters preceding their titles, which are:

[2] Verzeichnisz der bekanntesten Wasservögel in Labrador. Nro. 52, 13 März, 1844, columns 421-422, and Nro. 53, 14 März, 1844, column 425.

[3] Land-und Strandvögel, Nro. 53, 14 März, 1844, columns 426-429.

Together these present notes on 60 groups under Eskimo names.

At the upper left of the first page of each "Anzeigen" is reference to the Bulletin; thus on No. 52 it is to Bul. 16, and on No. 53 to Bul. 17.

One of the two complete sets of the Bulletin in North America is in the State Museum, Albany, New York, where Mrs. Lillian C. Stoner kindly examined Volume 3 (1844) and reported the findings to me. The references are exactly as given above except for bulletin and column numbering which are:

[1] Nro. 16, 13 März, 1844, cols. 122-125

[2] Nro. 16, 13 März, 1844, cols. 125-126 and Nro. 17, 14 März, 1844, col. 129

[3] Nro. 17, 14 März, 1844, cols. 130-133

To sum up: In this case, at least, the contents of the articles in the Bulletin and Anzeigen are apparently identical, and the rarity of the Bulletin will be no insuperable handicap to those wishing to consult the *Verzeichniszen*. However, they are of slight value except to persons interested in Eskimo names of vertebrates. The annotations explain these names, but include no scientific designation, and only brief references to habits. The member who presented the articles to the Akademie and who must be cited as author was Gotthilf Heinrich von Schubert, 1780-1860. The real contributors were some of the Moravian missionaries who for nearly two centuries have worked with the Eskimos and have four stations on the coast of Labrador. In the Schubert transmittal (Anzeigen 52, columns 417-418) are meteorological notices and in Anzeigen 53, column 430, Dr. Zuccarini is recorded as saying that valuable notes had been received from the same correspondents on the flora of Labrador. One of the missionaries, Samuel Weiz, published a "List of vertebrates observed at Okak, Labrador" (Proc. Boston Soc. Nat. Hist., 10, 1866, pp. 264-269).

NOTES AND OBSERVATIONS

Breeding of the Sora in New Brunswick. — Although the Sora *(Porzana carolina)* is commonly reported in New Brunswick I am not aware of any published nesting records for this province. On June 20, 1948, I was fortunate enough to find two nests of this species in the Midgic Marsh about four miles from Sackville, Westmorland County, New Brunswick.

The nests were located about 100 yards apart in the midst of a dense area of cattails *(Typha latifolia)*. Both nests were well concealed and were placed about six inches above the water. The first nest contained seven fresh eggs (one of which was collected). There were five eggs and one newly hatched young in the second nest. The second nest was easily located due to the behavior of the parent bird which exhibited great anxiety and remained in the vicinity.

On July 8, in another part of the marsh, about one half mile distant, a young rail presumably of this species *(Porzana carolina)* was seen swimming across a small ditch. — GEORGE F. BOYER, Dominion Wildlife Service, R.R. #1, West Sackville, N.B.

Ground-Nesting Robins. — During the early part of the summer of 1947, two nests of the robin *(Turdus migratorius)* were found on the ground in an apiary owned by Robertsons Reg'd., Cedar Park Station, Pointe Claire, Que.

While the proprietors were examining a hive of bees, a robin flew from under the hive. Closer examination revealed a well-defined "run" through the grass, leading to a depression in the ground at the side, thence to the space beneath the hive where the nest was located. The hive rested on two concrete blocks, at the front and rear, from four to five inches in depth and this, in addition to a natural depression in the ground allowed ample space for the nest. The entrance used by the bird between the bottom edge of the hive and the ground was not deeper than three inches.

The accompanying picture (Fig. 1) shows the nest containing three young, the hive having been moved to one side. The "run" to the nest was at the opposite side of the hive. It is of interest to note the relatively small amount of fibrous material used in the construction of the nest which consisted largely of mud, and that most of the fibrous material is on the side of the nest nearer to the outside of the hive.

Some fifty feet from the nest referred to was another robin's nest. This was built in a depression in the ground close up against the side of a hive; it contained two young, was of normal construction and was surrounded by grass.

The writer has found robin's nests in unusual situations, but never before on the ground, although it is understood that robins sometimes choose this situation at or near the northern timberline. Whether the bees afforded some protection against predators is unknown, although such protection would not apply to skunks, which are by no means unknown in the neighbourhood and which are sometimes a nuisance in the apiary. — W.E. WHITEHEAD, Macdonald College, Que.

Fig. 1. Robin's nest containing three young birds.

Rana p. pipiens. — About two years ago, Mr. Richard Ritchie, who lives at Mile 349 Hudson Bay Railway, wrote me that he had collected a frog at mile 33 on the same railway; his description fitted that of the leopard frog; he stated that he had never found them at mile 349 after many years of residence there.

On the 7th. September, Ritchie collected an adult leopard frog 7 miles North of mile 349 on the North bank of the Limestone River and he saw another specimen later on but let it have its freedom. This frog has

been sent in to me alive and I have added it to the Museum's collection.

This may be a considerable extension of the frog's known range, at all events at this longitude and should be recorded.

The measurements are: — Total length 65 mm.; Hindleg to tip of 4th. toe 114; Hind foot to tip of 4th. toe 52. Head (tip of snout to rear of tympanum) 23.

It will be of interest to investigate the relative length of the leg to that of the total length, to see if there is a shortening of the leg toward the north, as in the cases of *Pseudacris nigrita* and *Rana sylvatica*. — L. T. S. NORRIS-ELYE, Director, The Manitoba Museum, Winnipeg, Man.

Breeding Killdeers in Northern New Brunswick. — In the summer of 1945, Mr. R. B. Ronalds of Bathurst, New Brunswick, reported a pair of "field plovers" nesting in a grain field on his farm. In the spring of 1947 I had the opportunity of investigating the matter and on June 12 two adult Killdeers *(Charadrius vociferus)* and four downy young were seen in the same field in which the birds had nested on previous years. The young were about four days old at that time. I observed the adults again on June 1, 1948. Mr. Ronalds reports that the birds have nested on his farm since 1943. This, I believe, constitutes the first breeding record of the Killdeer for Gloucester County, New Brunswick, if not for the Province. — AUSTIN W. CAMERON, Port Hood, N. S.

BOOK REVIEWS

Geographic Variation in Newfoundland Birds. *By Thomas D. Burleigh and Harold S. Peters. Proceedings of the Biological Society of Washington, Vol. 61, pp. 111-126, June 16, 1948.*

Newfoundland, geographically isolated as it is from the North American mainland, has long been of especial interest to taxonomists. In the past, no less than twelve geographical races of birds have been described from that relatively small part of the continent. Now, with approximately 2,000 bird specimens from Newfoundland available for study, Burleigh and Peters recognize and describe eight additional subspecies, of which the type localities of seven are in Newfoundland. The new subspecies are: *Parus hudsonicus rabbittsi, Troglodytes troglodytes aquilonaris, Hylocichla guttata crymophila, Hylocichla ustulata clarescens, Dendroica striata lurida* (type loc. Nushagak, Alaska), *Seiurus noveboracensis uliginosus, Euphagus carolinus nigrans,* and *Carpodacus purpureus nesophilus.*

Critical comment is made on the validity of several other races. *Dendrocopos pubescens microleucus* (Oberholser) is placed in the synonomy of *D. p. medianus* (Swainson); *Sphyrapicus varius atrothorax* (Lesson) a synonym of *S. v. varius* (Linnaeus); and *Geothlypis trichas pelagitis* Braund and McCullagh is regarded as being inseparable from *G. t. brachidactyla* (Swainson). On the other hand, the authors affirm the validity of *Perisoreus canadensis sanfordi* Oberholser; *Certhia familiaris anticostiensis* Braund and McCullagh; *Turdus migratorius nigrideus* Aldrich and Nutt, *Setophaga ruticilla tricolora* (Müller), and *Pinicola enucleator eschatosus* Oberholser. Of interest too is that *Colaptes auratus luteus* Bangs, *Hylocichla minima minima* (Lafresnaye), and *Melospiza melodia melodia* (Wilson) were found to be the breeding forms of their respective species in Newfoundland.

Although typographical errors are few, one occurs unfortunately in the spelling of the generic name *Parus* in the description of the race *P. h. rabbittsi* (p. 115) and on the previous page the subspecific name *sanfordi* is misspelled. Such things are minor, however. The paper is an unusually valuable one and one that will be consulted by bird taxonomists for a long time to come. —W. EARL GODFREY.

THE FRESH-WATER FISHES OF BRITISH COLUMBIA. *By G. Clifford Carl and W. A. Clemens. 132 pp. 1948. 50 cents. Handbook No. 5. British Columbia Provincial Museum.*

This handbook by the Director of the British Columbia Provincial Museum and the Professor of Zoology, University of British Columbia is a welcome addition to the small but growing list of publications dealing with the freshwater fishes of Canada. Fifty-nine species are described, 41 freshwater and 18 found in salt water as well as in freshwater.

Three species are represented in British Columbia by subspecies, bringing the number of forms found in B.C. freshwaters to 64. Twelve of the 59 are introduced species. For each of 56 species there is a black and white illustration by Frank L. Beebe. There are six coloured illustrations of trout. Accounts of distribution and life history notes accompany the description of each species. Keys for identification are provided. The introduction includes brief accounts of the fishes' environment and structure and a discussion of the distribution of fishes in the Province and of their economic importance.

References to other publications of interest or value in the study of British Columbia's freshwater fish fauna include 34 listed as useful references and 121 special references.

The Provincial Museum and the authors are to be congratulated on the preparation and publication of this handbook which should be found most useful to anyone interested in the freshwater fishes of British Columbia. — J. R. DYMOND.

The Flight of Birds Analyzed through Slow-Motion Photography. *By John H. Storer. Cranbrook Institute of Science, Bloomfield Hills, Michigan. pp. 94. $2.50.*

The flight of birds is so entrancing to all of us and so fundamental an attribute of the group that it is astonishing to think how little work of real worth has been published on it in North America. True enough, plenty has been written about bird flight. Scattered through American ornithological literature the interested reader will find an imposing number of articles on the subject; but as his search progresses it is increasingly borne upon him that an appallingly large proportion of them have been written in complete ignorance of the elements of aerodynamics. Here at last is a contribution written with full regard to the fundamental principles involved. That is a sufficient distinction to make Mr. Storer's book a valuable contribution to an important field, but there is more to it than that. I have advisedly quoted the full title of the book above (on the cover it is shortened to *The Flight of Birds)* because it is essentially a specialized study from the viewpoint of the cinematographer. Just enough elementary aerodynamics is included to explain the principles of flight to the uninitiated (I hasten to assure the unmathematical that there is not a formula in the book); but the viewpoint stressed throughout most of the text is that of the function of the primary feathers as individual airfoils and collectively as a slotted wing. The world literature on bird flight is so scattered and voluminous that no man can safely claim familiarity with it all, but I believe I am right in saying that this is the most adequate treatment of the slotted bird wing in English. The only previous detailed study that I am familiar with viewed wing slots simply as a stability device and overlooked their major functions.

I wish now to venture some criticisms of Mr. Storer's book, at the risk of making this review unduly long, because, the field being so inadequately treated, it will otherwise be difficult for the novice student of bird flight to assess this new contribution accurately. My criticisms deal largely with omissions rather than commissions; and possibly some of them will be regarded as unfair. Who is to say what this book should include? Or, to put it another way, do we go by the title on the cover or by the more restrictive one on the title page?

The point that strikes me most is that the book does not give a balanced picture of bird flight as a whole. Because of its basis in motion-picture technique the detailed studies are mainly of a few large birds such as the American Egret and the White Pelican. Furthermore, the detailed sequences are necessarily of birds landing or taking off and level flight does not get an adequate treatment. For many of us who live inland and in the North, small birds, particularly passerines, are the main subjects of our bird study. The passerines are not only the climax evolutionary bird group but must also be placed at the top for all-round flying efficiency. Their slotted elliptical wings, all of the same general type, but modified in each species for its particular mode of life, are aerodynamic marvels. Readers of Mr. Storer's book are urged to remember that some of his points may not be of general application. My belief is that many passerines do not use their slots, fully at least, *in level flight,* but that the wing is essentially a simple airfoil during the down-stroke. The arbitrary distinction between the inner and outer wings is perhaps unduly stressed for there is usually a smoothly changing pitch, and so a smooth gradation from predominant lift to predominant thrust, from root to tip. More attention is given to the tail as a slot component than as a flap; yet it is certainly vastly more

important as the latter. Indeed the changes made in the wing and tail attitudes for landing are not adequately presented: the tail is spread and lowered as a flap; to keep the centre of pressure constant the wing is pulled forward by the ligament that runs out round the front of the wrist; this action sets up many other changes including increase in area of the inner wing by tensing the ligament and moving the leading edge forward and of the outer wing by separating the primaries, opening the alula slot, opening the tip slots, increasing both regular and lateral camber, and probably some other small changes that are difficult to prove.

From some of the figures given I am doubtful about the author's usage of aspect ratio. In aircraft parlance, and there is no other acceptable standard, the aspect ratio is span/chord. To obviate the difficulty of averaging a varying chord the mean aerodynamic chord, area/span, is used and the formula becomes $span^2$/area, in which span is the length from wing tip to wing tip and to measure the area it is assumed that the wing is continuous through the body. By this method the aspect ratio of a pigeon is about three quarters, not one-third of a Herring Gull's. Engineers will also find rather confusing an inverted ratio for wing loading given with some of Poole's figures for weights and wing areas.

There are several possible explanations of the origin of undulating flight other than the one offered; one of the likelier ones is that, often coupled with delfectively coloured tail feathers that flash on each dip, it serves as an escape mechanism from larger and less manoeuvrable predators.

It is suggested that a hummingbird's wing is so specialized for hovering that it is not suited to endurance; but the Ruby-throated Hummingbird, which is probably a fair example, not only flies fast and far, but possesses an advanced high-speed wing very similar in form and structure to that of the Chimney Swift and in form to that of other fast-flying groups such as the falcons, plovers and swallows.

The section on soaring is generally sound, but there are many types of up-draft besides those given. The mixed thermo-mechanical up-drafts upon which the buteos depend so largely in hilly temperate regions are not mentioned. I also confess myself puzzled by the apparent suggestion that a bird may secure thrust from its own wing-tip vortices. Finally I find it curious that the author in this section, and Ludlow Griscom in his forword, are so puzzled by the fact that soaring wings fall into two categories — slotted and high aspect ratio. To obtain extremely high lift, for soaring, carrying prey or both, a bird may have a highly slotted wing, one with a high aspect ratio or a combination of the two. The slots in both the diurnal predators and the owls are largely square-cut at the base, a good example of convergent evolution and a highly efficient form, and are deep and numerous in those that soar. The aspect ratio runs from 5.8 in the Red-tail to 7.4 in the Golden Eagle and unquestionably higher in the largest vultures; it must inevitably be higher in the heavier birds for with comparable form the wing loading goes up as the power of 3/2 of the linear dimension. In the oceanic soarers with no well-formed slots the aspect ratio runs about 8 to 9 in the gulls, about 11 in the smaller albatrosses and about 15 in the large Wandering Albatross. These figures give a rough idea of the reduction in wing length that can be effected with slots. To visualize the wing of the Wandering Albatross remember that 15 is nearly the aspect ratio limit for sail planes, that few airplanes have a ratio as high as 10 and that in fighter planes it is commonly about 5. The albatrosses are not seriously discommoded by their long wings: they make few take-offs in a day, sometimes none for many days, and when they do take wing they usually launch from a cliff or wave crest; it is seldom that the wing tips strike anything but air or water and consequently they suffer little damage. Now, just try to visualize any of the land-dwelling soarers, with their wings proportionately lengthened to compensate for loss of slots, as they feed on the ground, roost in trees, and hunt their prey in rough ground or woodland. How long would the primaries remain intact if by some miracle the bird did not hang itself? Finally consider the pelicans, which are intermediate in habitat and in wing form. A bird the size of the White Pelican would probably require eighteen inches added to each wing to compensate for its slots, making the wing cumbersome if not unmanageable. Actually, rather than declare that the pelicans' great weight is lifted easily by their special form of wing, let us say that a combination of ample slotting and moderately high aspect ratio has allowed them to develop great size but still fly easily and avoid obstructions. — D. B. O. SAVILE.

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OUR EIGHT-FOOTED FRIENDS[1]

WILLIAM E. RICKER
Indiana University, Bloomington, Indiana

THROUGHOUT the great arachnoid group of arthropods, eight is usually considered to be the correct number of legs for grown-up individuals. Among these, it is the ticks and mites which are associated most closely with man and other mammals. Luckily or unluckily, inhabitants of eastern Canada have little chance to become acquainted with these creatures. *Dermacentor variabilis,* the eastern wood tick which commonly attacks man, has been taken only rarely in southern Ontario and in Nova Scotia, though it is common immediately to the south. Similarly chiggers *(Eutrombicula)* and related parasitic mites seem to be unknown to practically all Canadians, in spite of their abundance in the states immediately below the lower Great Lakes. In many years of roaming about in various parts of Ontario, particularly in the neighborhoods of Lake Nipissing, the Toronto region, Oxford County, Algonquin Park, Grey and Dufferin Counties, etc., the writer had never been attacked by wood ticks or mites and did not even recall meeting anyone who had. The itch mite, *Sarcoptes scabiei,* is of course not unknown in Canada, but it is usually assigned to the field of medicine rather than natural history and need not be mentioned further in a journal like the *Canadian Field-Naturalist.*

Acarina commonly have three stages in their life-history — a six-legged larva, an eight-legged nymph, and an eight-legged adult. Any one, two, or all three of these may be parasitic on vertebrate hosts. Among the ticks that attack man, it is usually the adult which is involved, the nymphs commonly frequenting smaller vertebrates, sometimes reptiles rather than mammals. By contrast, among the trombiculid mites the minute larvae are the "chiggers" which attack man and other vertebrates, whereas the nymphs and adults are harmless scavengers.

On taking up residence in Indiana some nine years ago, the writer very quickly made the acquaintance of both wood ticks and chiggers. The former are fairly numerous in the wooded hills around Bloomington and are often picked off of the clothing, or more rarely out of the skin, after any kind of field excursion in May or June. But they are no particular nuisance. After lodging on the skin or clothing, it takes a long time for them to get started feeding, and after even a day's hike none are likely to be attached by evening. Their "bite" is painless, and even if they are accidentally allowed to engorge, there are no ill effects. There is, for example, no trace of the intense and prolonged irritation such as accompanies the attachment of *Ixodes pacificus* of the Pacific coastal rain forest. Nor do they produce the paralysis which sometimes results from the feeding of the larger *Dermacentor andersoni* of the dry interior of British Columbia. And although spotted fever has now been diagnosed from the eastern United States and is known to be carried by *D. variabilis,* it is as yet exceedingly rare in the east and for practical purposes can be ignored.

If the Indiana wood ticks proved to be benign, as much cannot be said for the chiggers. These pests begin to appear late in June and are finally routed only by cool weather in October. They are so tiny that they are practically never observed before they attack, so that the unsuspecting host has no warning of his impending misery. Though there is no reason to doubt that chiggers could complete their larval development on man, it seems likely that they rarely actually do so. Attaching themselves to the skin, they secrete a liquifying saliva and

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presumably commence feeding, but a human host can and does scratch the spot, which must quickly remove the mite and (usually) a good part of the neighboring cells.

Although the chiggers' misadventures on human skin must ordinarily end fatally, very few of us have so close a feeling of kinship with the rest of the animal world that these repeated tragedies would be a cause for concern. Even the most sympathetic would probably be content to shed a quiet tear and quickly forget them. But the skin is not willing to let one forget. It reacts to the presence of a chigger with local inflammation, swelling, and a tiny blister, or in medical jargon, a wheal surrounded by erythema and surmounted by a papule. The swollen area may become up to the size of a dime without outside assistance, in the writer's experience. Scratching, which is almost impossible to avoid, may considerably extend it. The symptoms develop rapidly on the day following exposure. They remain acute for about three days and then gradually subside, the itching becoming more and more sporadic, until after two or three weeks the lump is gone. Chiggers may take up residence almost anywhere on the body, but like to gather in such sequestered regions as the arm pits, the popliteal fossae of the legs, the navel, the groin, and the even more private parts immediately adjacent.

There is considerable individual variation in the severity of reaction to the presence of chiggers, just as there is for mosquito bites, poison ivy, etc. Whether or not tolerance can be acquired by the body after repeated exposure, as with mosquitoes, does not seem to be clearly established. At any rate *some* people who have been brought up in chigger country still react vigorously after years of "inoculation".

Like most well-known animals, the common chigger has been known by a considerable variety of scientific names. The most recent that has come to our attention is *Eutrombicula alfreddugesi,* used by Dr. Dale W. Jenkins at the Chicago A.A.A.S. meetings in 1947. The generic names *Trombicula* and *Leptus* are commonly found in the literature, as are the specific names *rileyi* and *irritans.* Like many other mites, chiggers are bright red in color in all stages of their life-history. The larvae are so minute (about 0.25 millimeter long by 0.15 wide) that ordinarily they are rarely seen, even by those who are frequently attacked by them. However, they are readily collected for observation by placing a black board or a white plate on the ground among brush or weeds and waiting for them to crawl onto it. In good chigger country the wait is certain to be a short one. Man is, of course, not the only host of chigger larvae, which seem to attach themselves to all land vertebrates indiscriminately. They are especially common on snakes and tortoises.

There seem to be no published records of the occurrence of chiggers in Canada, although they are known to range north into Michigan and Wisconsin (Jenkins). However, there are one or two other mites which at times attack man and which are known to occur in Canada. One is the straw mite, *Pediculoides ventricosus,* which is usually encountered where grain is being harvested.

"Remedies" for chiggers and allied mites are numerous. They include ammonia water, collodion dissolved in ether or chloroform, and various proprietary preparations. None that the writer has tried so far have given anything more than very temporary relief. However, hopes for a good one are not completely extinguished, and this coming summer we propose to try a mixture of 7 per cent phenol and 93 per cent glycerine, which is highly recommended by Dr. R. T. Hill of Indiana University's Department of Anatomy. However soothing this may prove to be, it is likely that prevention will still be better than cure. Recently-developed repellents like di-methyl phthallate or benzyl benzoate are said to effectively discourage mites, but before they came into view it had long been known that chiggers would avoid sulphur. Dusting exposed parts of the body or clothing with sulphur gives almost perfect protection, or the various polysulphides and other compounds used in itch remedies can be employed if their aroma does not bother you. Mr. Frank Wallace, Indiana's genial State Entomologist, is always careful to instruct the uninitiated that *flour* of sulphur is superior to *flowers* of sulphur, presumably because of its finer texture; but even the flowers seem to do a rather good job. However, one must remember the instructions:

the surphur *must* be applied to the skin or clothing. No amount of sulphur will be of any help whatsoever if it is back home on the shelf, in the car's glove compartment, or even in your coat pocket. Though this has been demonstrated many times, even experienced field workers will test one of the alternative hypotheses every once in a while, always with the same result.

Now Indiana is a very pleasant and beautiful state, and Hoosiers are well aware of it. White dogwoods and rose-pink redbuds adorn the country-side in spring, while bob-whites call from the fence rows. In summer, fields and waysides gleam with white spurge, yellow sunflowers, orange milkweed and purple ironweed. In autumn the woods are brilliant with the scarlet leaves of red gum and the crimson of the oaks; and when the leaves fall, the fruits of bittersweet and wahoo remain to brighten the landscape, while hickory nuts and persimmons can be gathered by whoever will search for them. In winter the twisted limbs of giant sycamores match the whiteness of the snow along the banks of the Wabash and of many a less celebrated stream. Even features at which a stranger looks askance may be loyally defended by a native son. During the stickily-blistering "hot spells" of summer, it is some consolation to opine that this is just what is needed — good corn-growing weather. A few will even insist, to all appearance seriously, that the hotter it gets the better they feel. But in spite of these strong bonds of custom and of loyalty, I have never, no never, heard a Hoosier maintain that chiggers are of any use whatever, or that he would be in any way sorry to see the last of them.

With this background, my friends in Canada will readily see that down here it has been most difficult to refrain from remarking on the absence of chiggers farther north. To be truthful, I have not refrained: instead, all these years I have been boasting about it from time to time, modestly and deferentially I hope, but still, boasting. On one such occasion my good friend Abe Andrews, the "old fisherman" and philosopher of Dewart Lake, refused to believe my story, and told how he once ran into a bad mess of chiggers near Ogidaki on the Algoma Central Railway, which is his favorite trout country. Of course I wrote this off mentally as a case of black fly bites, though tactful inquiry revealed that Abe knew all about black flies and their bites, just as he knew all about chiggers.

So things stood up to this past summer, when there occurred a painful and humiliating experience. Vacationing on the shore of Lake Nipissing a few miles southeast of North Bay, Ontario, on July 24, four boys and I undertook a two-night camping trip to Callander Bay. The details of this do not concern us, except that our camp was pitched on an island of two or three acres in extent, at the mouth of the bay and on the lake side. Though there are a few cottages on other islands within a mile or so, this one has not now and has never had any permanent habitation. Its only visitors are occasional picnickers or fishermen, and, very rarely, campers like ourselves.

In this out-of-the-way spot three of us contracted moderately bad cases of what, searching for a non-committal term, can be called trombiculosis — we had 20 or so "bites" each. We were flabbergasted, for the symptoms were identically like those associated with chiggers: the same kind of swellings, the same intense and intermittent itching, the same preference for obscure situations, the same length of incubation, and the same fortnight-long duration of the effects. Furthermore, it could have been none of the more familiar pests of the region. Mosquitoes were numerous at camp in the evening, and possibly a hundred or so bites apiece from them gave no such results. Black flies were not found around our camp or elsewhere during those days; and anyway we had all been plagued by black flies on a visit to the Little Sturgeon River a week previously, again with quite different (though in one case equally painful) effects. Of course the question of whether they really were the common chigger must be left open. Perhaps they were straw mites, though we were miles from any grain fields. One thing is certain, however: I will never again have the courage to argue that there are no chiggers in Ontario. If there is something so much like them that you can't tell the difference, it places the counsel for the defense in an impossible position.

For anyone interested in collecting our brand of mites in this area, our experiences

may give a clue concerning how to proceed. Two of the boys slept in a tent having a canvas floor sewn to the walls and with only the front open; they attracted very few mites. The other three of us were merely in a mosquito tent with a rather small ground sheet below so that we spilled over onto the forest floor from time to time. Since the bites began to appear only after reaching home, we probably were not located by the mites in any numbers the first night. Possibly the mammalian aroma of the blankets was enough to attract them to the site during the day so that they were ready for us when we lay down the second night. At least the mosquitoes did just that. Practically absent when we pitched camp at sundown the first day, they quickly accumulated by hundreds and thousands on the mesh walls of the tent, on the fly above, and on neighboring trees. There they stayed all night and all next day, though during daylight hours the rest of the island seemed almost free of mosquitoes.

It seemed incredible that of all the campers that infest the north woods in summer, we alone should be favored with the attentions of parastic mites, so I have recently made a few inquiries. To start with, of course, there is Abe Andrews' story of his experience in Algoma, which apparently was repeated this past summer (1947). Dr. W. J. K. Harkness has recalled that, about 1930, A. L. Tester and others had encountered something of the sort on the Bass Lake portage on the west side of South Bay, Lake Nipissing, not far from the scene of our disaster. Unfortunately memory of the incident seems to have faded from the minds of the participants, so I have not heard a detailed circumstantial account of it. So far nothing more has turned up. It seems obvious that others must have had similar experiences, and the writer would be interested to hear of them. Better yet, if someone should be stimulated to collect specimens, a picture of the Canadian distribution of such mites would gradually emerge. Any tiny red mite can be *suspected* of being a chigger or other parasitic form and should be sent in for identification. If true chiggers do occur in Canada, it seems likely that populations of noticeable size will prove to be rather sharply localized, because otherwise they would be much better known. Even within the present range of chiggers there occur blank spots. For example, they do not seem to be encountered in the north-western part of Indiana, which consists of sandy oak ridges interspersed with stretches of what was originally the wet tall-grass prairie, though they are common enough on the moraine hills and outwash plains of Kosciusko County a little to the east. Toward the northern limit of their range such gaps in distribution might well become larger, and in the end there would be a series of isolated colonies separated by large areas of uncolonized country. What climatic or edaphic features might determine such a distribution are completely unknown at present. Or, possibly, sporadic occurrences of parasitic mites in the north might reflect a generally distributed population at a very low level of abundance, which in some years or in some situations can fluctuate to a rather high peak. One aspect of this hypothesis could be tested by visiting our island again in 1948. If we are in the neighborhood, the procedure for collecting the creatures will be different from that used last year.

Before concluding, it is necessary to return to the 1947 camping trip, for our eight-footed friends had one more surprise in store. The day following the expedition, while examining various spots to make absolutely sure they really were chiggers, it turned out that one of the boys had also collected a wood tick. It was a small specimen, about 3 millimeters in length, which had become well imbedded in the skin of the chest and seemed ready to start feeding, or perhaps was already in the act. Dr. J. D. Gregson, of Kamloops, B.C., has identified it as a nymph of *Ixodes cookei,* a species normally found on small mammals. Adults of this species are known to attack man occasionally, but Dr. Gregson was unaware of any record of the little *nymph* doing so. Possibly this specimen was an acarine Einstein who reasoned that it was all right to make himself at home because, relative to a moose, the potential host on which he found himself was, without question, a small mammal!

THE AMERICAN BRANT ON THE LOWER GREAT LAKES [1]

R. W. SHEPPARD
Niagara Falls, Ont.

ON June 6, 1946, there appeared in the 'Niagara Falls Evening Review' an article entitled "Black Brant Geese Devastate Field of Carrots in Port Weller" which went on to indicate that the game warden and deputies of Lincoln County were puzzled over the presence of about fifty (Black) Brant Geese which had feasted for two days on the tops of young carrots.

An immediate investigation, made with the kindly help of Mr. Roy Muma, Game Warden of Welland County, produced further information, and the partially dismembered body of an American, or white-breasted, brant which was subsequently forwarded to the Royal Ontario Museum where it was made into a skin, and pronounced by L. L. Snyder, Assistant Director, to be a young male of the previous summer, and referable to the form *Branta bernicla hrota* (O. F. Müller).

Following the appearance of the newspaper article on June 6, and the immediate investigation which resulted in the acquisition of a specimen, additional inquiries were instituted with the following results: — The carrot field so heavily and persistently attacked by the hungry geese was found to be located on the south shore of Lake Ontario between Port Weller and Port Dalhousie, and to comprise some 13 acres which stretched to the very edge of the lake side cliff which at this point is some 30 feet in height. The grower, Mr. F. Short of Vineland, who rented the ground from a Port Weller farmer, informed me during the course of conversation that he had to replant about 8 acres of the total 13 acres of carrots due to the persistent depredations of the brant geese over a prolonged period of time. Mr. Short also informed me that the geese visited his carrot field repeatedly, and quite regularly throughout the month of May, and until the 10th of June; but in varying sized flocks, never less than 6, or more than 30 at one time. It would appear that the flock suffered some further casualties while the Lincoln County Game Wardens were shooting in an attempt to frighten the geese from the vicinity for, in addition to the single specimen procured for the Museum by the prompt action of Mr. Muma, several masses of goose feathers among tall weeds at the edge of the cliff, were shown to the writer by Mr. Short upon the occasion of the investigational visit to the damaged carrot field, and from among these several groups of supposed brant feathers, a number of primaries and secondaries were collected for further verification.

No personal observations were made of the geese during their series of attacks upon the carrot field, but when in the general vicinity on June 14, the writer had a distant view through field glasses of what was undoubtedly a portion of the brant flock resting far out on the Lake, on the east side of the long breakwater at Port Weller.

During the period that the flock of 30 were paying their repeated visits to the carrot field near Port Weller, Royal Ontario Museum records show that a flock of 19 occurred at Wiarton, Georgian Bay, where they were photographed by W. H. Luner on May 19; a single individual was seen on May 25 and 26 by Jas. Savage and several other members of the Buffalo Ornithological Society, near the light house at the end of Point Abino on the north shore of Lake Erie, and 2 American brant were observed on the same two days at the Eastern Gap, Toronto, Lake Ontario, by J. L. Baillie and others.

This occurrence in the vicinity of Port Weller, supported by specimens, would appear to be the first authentic record of brant geese on the Lincoln County shore-line of Lake Ontario, and as this species has been exceedingly rare, at least until recent years, in the Lower Great Lakes regions of southern Ontario, it would seem advisable at this time to record here in some detail a number of the previous occurrences which I have sifted from a quite substantial number of Ontario records kindly supplied to me by Messrs. L. L. Snyder and J. L. Baillie Jr. of the Royal Ontario Museum of Zoology.

It would appear unnecessary to include here all of the Ontario occurrences recorded

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at the Museum, and so it is proposed to confine the present review to those pertaining to the regions of Lake Ontario, and Lake Erie, only; while even among these territorially restricted records it is probably advisable to eliminate, and not perpetuate in literature, a few of the earlier reports based on hearsay, and second or third person statements, for it is well known that the term brant has been in the past, and still is to some extent, very loosely applied by sportsmen, and many others, on this continent.

Upon that basis, and within the territory defined, the history of *Branta bernicla*, prior to the year 1946, would appear to be somewhat as follows:

Exactly eighty years before the occurrences now being placed on record, T. McIlwraith (Communic. Essex Inst., Vol. 5, No. 13, Nov. 18, 1866: 94) wrote of brant geese as being frequently killed spring and fall at Baptiste Creek. Sixteen years later J. A. Morden and W. E. Saunders (Can. Sports and Nat., Vol. 2, No. 12, Dec. 1882: 194) call it a "Rather rare migrant" in S.W. Ontario. Stated by McIlwraith (Journ. and Proc. Hamil. Assoc. 1886: 92) to have been seen only once in Hamilton, we do not hear of the brant again in the Lower Great Lakes until J. H. Fleming (Auk, Vol. 23, No. 4, Oct. 1906: 446) mentions a female in the Royal Ontario Museum shot by A. Hume at Ashbridge's Bay, Toronto, on December 2, 1895, and a male shot at Toronto by Amos Bunker on November 12, 1899. In the Auk, Vol. 47, No. 1, Jan. 1930: 66, J. H. Fleming mentions a male in the R.O.M.Z. collection which first appeared at the Miner sanctuary in Kingsville on October 27, 1918, was seen there by W. E. Saunders in November, 1918, and died Feb. 24, 1929. At nearby Rondeau on Lake Erie the species was obtained once according to Dr. G. T. McKeough (Papers and Addresses, Kent Hist. Soc., Vol. 6, 1924: 60) who indicates that the specimen was at that time in Mr. Germaine's possession. John Townson in the Toronto "Globe" reported four seen at Weller's Bay on October 16, 1929, and one observed in the same location on October 10, 1932.

In October of the year 1934, according to L. L. Snyder (Univ. of Tor. Studies, Biol. Ser. 48, 1941: 42) one was shot by Roy Hogle out of a flock of about twenty-five brant in Massasagua Bay, Bay of Quinte; while on November 5 of that same year, one was shot out of a flock of twenty-five at Belleville, according to W. H. Lunn in R.O.M.Z. records, and on November 9, there is a James Savage record of one shot at Long Point on Lake Erie. In the late spring of the year 1938, at Humber Bay, Toronto, according to Museum records, a flock of seven brant were seen on May 25 by Mr. Branson; a flock of nine on July 11, by Mr. and Mrs. Murray Spiers and A. L. Beldan, and a flock of ten by A. Boissoneau and F. Barratt on June 13. In the fall of that year, on November 19, one was shot at Black Ant Is., Leeds Co., and recorded by G. C. Toner *et al* (Can. Field-Nat., Vol. 56, No. 1, Jan. 1942:12). In the spring of 1939, R.O.M.Z. records again show brant present near Toronto, with a flock of eight seen at Ashbridge's Bay on May 14, by H. Southern and G. Lambert, and on May 27 and 28, a flock of eight, possibly the same group, seen by J. L. Baillie and W. W. H. Gunn at Hanlan's Point. There would appear to have been a paucity of occurrence on the Lower Great Lakes for a period of two years or more; but the species appeared again in the fall of 1942 for Museum records show one seen at Sunnyside, Toronto, on November 11, by J. Crosby, and another, or possibly the same bird, seen at the same place by J. L. Baillie, R. M. Saunders, and others on November 15. Following a second two-year period without record, brant appeared again on both Lakes in the late spring of 1945, with four being seen at Rockhouse Point, Lake Erie, on May 27, by Seeber, Thorpe et al (Prothonotary, Vol. 11, No. 6, June, 1945) and on Lake Ontario, according to R.O.M.Z. records, small groups of two to six birds were observed on June 3, 4, 5, and 7, by J. L. Baillie, W. H. Martin, R. W. Travern and T. F. McIlwraith, off Hanlan's Point, Toronto.

From a perusal of the foregoing records, it is evident that, whatever the cause, failure of maritime eelgrass feeding grounds, or disturbance along normal migration routes, brant occurrences on the Lower Great Lakes during the past ten to fifteen years have been very much more numerous than in all of the preceding sixty-five or seventy years covered in this account.

INCREASED ABUNDANCE OF AN UNUSUAL BRITISH COLUMBIA FISH, THE CALIFORNIA POMPANO [1]

J. L. HART
Pacific Biological Station, Nanaimo, B.C.

THE "CALIFORNIA" POMPANO, *Peprilus simillimus* (Ayres) has been infrequently taken in British Columbia waters. Clemens and Wilby (Bulletin Fisheries Research Board of Canada No. 68, 1946) record four specimens over a thirty-three year period and state, "This is a fish of southern distribution and only an occasional stray reaches western Canadian waters". Recently the species has been rather frequently reported. The following records have been reported to the Pacific Biological Station directly. All dates are in 1947, unless other wise noted.

Dec. 1-7, 1946. Mouth of Fraser R. — Two.
Jan. 5-12. Off Pender Is. South Georgia St. — One.
Jan. 12-18. Boat Hr.—Near Nanaimo, Vancouver Island (V.I.) — One.
Jan. 26—Feb. 1. Near Ucluelet—West Coast of V.I. — Two.
Feb. 15-22. Barkley Sd., 100 pounds. Other boats reported occasional specimens.
April 3-11. Mouth of Fraser R. Three taken during week, two by a shrimp trawler and one by an otter trawler.
May 4-10. Barkley Sd. — One.
July 29. Bargain Hr. Central Georgia St. About 150 pounds taken in bait seine.
Nov. 14. Canoe Pass, mouth of Fraser R. Several (?) about 3 in. long. Others reported from graycod stomachs.
Nov. 23-30. Russell Ch., Clayoquot Sd. — Ninety.
Nov. 23-30. Imperial Eagle Ch., Barkley Sd. — Two.
Nov. 23-30. Off Wichaninnish Bay, West Coast of V.I. — One.
Dec. 1-7. Off North Arm of Fraser R. — One.
Dec. 1-8. Off Canoe Pass, mouth of Fraser R. — One.
Feb. 3-7, 1948. Mayne Bay, Barkley Sd. — Several. A crewman says they occur here all year round.
Feb. 29—Mar. 5, 1948. Toquart Bay, Barkley Sd. — About six.

Additional records are to be found in the recent accessions and notes of the Provincial Museum at Victoria, kindly supplied by Dr. G. C. Carl as follows.

Jan. 1946. Pender Is. — One.
Oct. 14, 1947. Off Port San Juan, southern part of the West Coast of V.I. — One.
Feb. 6, 1948. Mayne Bay. 150 pounds. Others were reported from Clayoquot Sd. at about the same time.

The number of single records and the several sizable landings strongly indicate marked increase in abundance beyond the former condition of rarity. It should be noted, however, that no substantial increase in range is indicated.

The increase in abundance of pompano is not limited to the part of its range in British Columbia. The following paraphrase of part of a letter from Mr. J. B. Phillips of the California Division of Fish and Game describes the increase in abundance which has taken place in California.

Continuous records of the commercial catch of various fishes were started in California in 1916. In that year the state catch of pompano was recorded as approximately 25,000 pounds. The catch rose to 62,000 pounds in 1919. This was followed by a decrease to 9,000 pounds in 1925, and in the years following the total state catch varied between 1,000 pounds and 10,000 pounds. In 1944 there was a slight increase to 12,000 pounds; in 1945 the catch jumped to 70,000 pounds; in 1946, to 87,000 pounds and in 1947, to well over 100,000 pounds. Previous to 1946, the major portion of the landings occurred in Southern California, with smaller amounts being landed at Monterey Bay ports (primarily Santa Cruz and Monterey) and San Francisco. In 1945, the significant increase in the state total was accounted for as usual in Southern California, but with an appreciable increase for Monterey Bay. However, in 1946, the poundage landed at Monterey Bay, which previously had not been more than 9,000 pounds for any one year,

[1] Received for publication April 14, 1948. A later report states that several pompanos were taken by trawlers operating in Mayne Bay, Barkley Sound, on January 14 and 15, 1949.

rose sharply to 44,000 pounds; in 1947, it had climbed to 137,000 pounds, becoming as great or greater than the poundage landed in the Southern California region. Although there was a significant increase in the poundage of pompano landed in Southern California during 1945, 1946 and 1947, it has not kept apace with the spectacular increase shown for the Monterey Bay area.

The increased abundance of pompano, particularly for the Monterey Bay area is reflected in the price that fishermen receive for their catch. In the past a high price has been maintained because a few discriminating gourmets could afford to bid up the price on a limited supply. Previous to 1945 fishermen generally received about fifty cents a pound with occasional small catches bringing as high as eighty cents to one dollar a pound. In April and May of 1947 when some 47,000 pounds of pompano were landed at Monterey and Santa Cruz an oversupplied market caused the price to fishermen to slip to seven-and-a-half cents a pound. The price recovered later and has since fluctuated around twenty-two cents a pound.

It is evident that the species has experienced an upsurge in abundance in the north part of its range.

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NOTES AND OBSERVATIONS

Ophioglossum vulgatum L. in British Columbia. — Early in September 1932 the writer travelled by car from the Needles, on the Arrow Lakes, to Vernon, over the Monashee Pass, by the old road. After crossing the second summit, car trouble caused a halt, and advantage was taken of this to search for plants in the vicinity. As it was late at night an electric torch had to be used, and by this means a small colony of an annual gentian was found in fruit close to the road. As it was seen that most of the seed had been shed, a considerable amount of soil was removed with the plants, and the whole placed in empty tobacco tins. This soil, together with the broken up remains of the gentian plants, was scattered over the surface of a newly prepared "pocket" in the writer's rock-garden, and for several years produced an annual crop of dwarf, small-flowered gentian plants. These were identified as the *Gentiana tenella* of Henry's Flora (possibly *G. monantha* A. Nels. but specimens were, unfortunately, not preserved). Eventually, they failed to re-appear, the seed presumably, for some reason, failing to mature. Above the "pocket" were plants of *Penstemon Scouleri,* raised from seed and at one point, in a recess, a branch had overhung, and eventually died. On removing the dead branch the discovery was made of a few fruiting specimens and some sterile smaller fronds of *Ophioglossum.*

It seems probable, therefore, that spores or prothallia of *Ophioglossum* were present in the Monashee soil, and developed in the shade of the *Penstemon,* finally producing mature ferns. This is the only colony noted to date, although spores have been produced annually for many years. No attempt has been made to artificially disseminate the spores. Unfortunately the writer has had no opportunity to revisit the spot on the Monashee Pass earlier in the season to make a search for the fern in its suspected place of origin. — H. MURRAY, Crawford Bay, B.C.

Adiantum capillus-veneris L. in British Columbia.—The presence of this fern at Fairmont Hot Springs, on the western slope of the Rocky Mts. in the Columbia Valley, has been known botanically since 1915, when Miss A. B. Mackenzie sent specimens to the Provincial Botanist, J. Davidson (1). Since then the plant has been collected by others, including the late W. B. Anderson and the present writer, who visited the station in 1941, 1943, and 1947.

The best-known site is the hot spring that supplies the water for the swimming pool at the Bungalow Camp. This arises at one side of the bed of the creek which skirts the camp, and has built up a basin of calcareous (?) matter around it. When the writer visited it in 1943 the fern was abundant around the rim of the basin, along the runnels of warm water which discharged into the creek, and especially in the covered flume which piped the water to the swimming pool. Here the fern was growing out of every chink and crevice for many yards from the spring. There were some hundreds of plants. On revisiting it in 1947 it was found that the spring had been completely boarded in and the old flume taken down and replaced by a new one. As a consequence, the only plants to be found were along the runnels by which excess water was discharged into the creek.

Fortunately there is another site, quite unused, on the hillside range a few hundred yards away, which Mr. Bartman, the manager of the hotel and camp, very wisely, does not reveal except to such persons as he believes are particularly interested and not likely to wantonly injure the fern. The hot spring here bubbles up in the middle of a shallow basin

about 10 feet in diameter, on a narrow terrace with a steep slope below. Along the west side of this there are some shrubs of dwarf birch and choke-cherry, and underneath them is a dense bed of the maiden-hair, as tall and luxuriant as anything to be seen in a greenhouse. The fern persists in an increasingly stunted form along the runnel that carries away the water from the basin until this spills over the steep bank. In addition to the common range grasses, other plants growing at the edge of the basin include *Triglochin palustris, Panicum thermale, Juncus Torreyi, Epipactis gigantea* and, perhaps fortunately, a good deal of poison ivy. The elevation of this spring is considerably lower than the one in the creek, but there is no apparent connection between them. Mr. Bartman discovered the fern at this site about 15 years ago, and as far as known to him it appeared there independently of human agency.

Since the fern is commonly cultivated in greenhouses by florists and others, and the nearest regions where it is known to be native are given by Abrams (2) as Utah and southern California, one's first impression is that it must have been planted by some enthusiast. Aside from the fact that there is no knowledge or tradition amongst the local residents of deliberate introduction, there is some historical evidence that it was well-established at the earliest stage of the settlement of the Columbia Valley.

In 1888 the Duke and Duchess of Somerset were members of a small hunting party which spent late summer and fall in the Valley, and the Duchess later published a book entitled "Impressions of a Tenderfoot", using the family name of her husband, St. Maur, under which they travelled in Canada(3). This book is in the form of a daily journal with only the dates of the months given, but the year of the visit is given in Baillie-Grohman(4). On the homeward journey, in October, they stopped at "Brewer's stopping-house" at "Hot Springs". It is evident from the description of the topography that this is Fairmont, although that name was not given until much later, and the "stopping-house" was apparently near what is now the highway up the Valley and below the springs. There was, apparently no settlement at the springs themselves, although their existence was well-known in the Valley. On page 202 is the following entry: —"I started for the Hot Springs after tea. A climb over a steep trail of nearly a mile brought me to the first basin, the water of which is perfectly hot and very clear; it is eight or nine feet long, about two feet deep and four feet wide; the overflow leaves a curious rocky-looking deposit, and in the crevices of the sandstone below quantities of maiden-hair fern grow. It is curious to see such delicate ferns growing here where the temperature is so low at night; but if one feels the ground, it proves quite warm, and must have, therefore, the same effect as a hot-bed."

It seems very probable from these remarks that she recognized the fern as *A. capillus-veneris,* which even in Britain is a greenhouse plant except in a few favored situations, mostly along the coast. In support of this interpretation it may be said that is unlikely that *A. pedatum* would be growing on an open hillside in the Arid Transition Zone. (There is a photograph of what is probably this spring in Baillie-Grohman, l.c. page 295). It is, in fact, if not entirely absent from this region, at least very uncommon. The writer spent six weeks in intensive collecting in south-eastern B.C. in 1947 without seeing it. This included a careful examination of the bed and banks of the "Hot Spring Creek" to an altitude of probably 4,500 feet.

Baillie-Grohman, l.c. page 229, states that when he first visited it, in 1882, only 11 white settlers lived in the whole East Kootenay area, most of them around the old mining camp at Wild Horse, near what is now Fort Steele. The main line of the Canadian Pacific Railway was completed in 1885 and by 1888 there was a considerable influx of miners, prospectors, and those catering to their needs, and Baillie-Grohman had begun work on the canal at Canal Flats. However, as we have seen in the quotation given above, the fern was well-established at this date and it is highly improbable that it was introduced by this early type of inhabitant.

A visit was also made to the hot spring at Radium about 20 miles north-east of Fairmont on the Banff-Windermere highway. In this case, however, the spring emerges near the base of a vertical cliff at the edge of a creek, and the swimming-pool has been built around it in such a way that the water runs in at or below the level of the water in the pool, while the effluent discharges directly into the waters of the creek. Under such conditions, even if the fern had been originally present, it could hardly have survived.

One or two other hot springs are known to occur in the region, but they are rather

remote and difficult of access, and pack-horses and a camping outfit are probably necessary to visit them. They might repay such a visit by an interested person with the necessary time and equipment as they are untouched by "development."

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4. Baillie-Grohman, W. A. Fifteen years sport and life in the hunting grounds of Western America and British Columbia. London, 1900. Page 283. — J. W. Eastham, Vancouver, B.C.

Chimney Swifts Nest in Woodpecker Cavity. — On August 6, 1947, while doing biological field work in the Liscomb Game Sanctuary, Nova Scotia, my attention was drawn to several chimney swifts *(Chaetura pelagica)* circling around a large, dead hemlock. Closer examination revealed that the birds were passing in and out of a hole made in the tree by a pileated woodpecker *(Hylatomus pileatus)*. The birds were observed for some time entering and leaving the cavity, The clamor of young birds could be heard from within the tree. It is a well known fact that swifts frequently nest in hollow trees which are open at the top, but this is the first instance which has come to my attention in which the birds utilized a cavity fashioned by a woodpecker. — AUSTIN W. CAMERON, Port Hood, N.S.

Cowbirds in Northern New Brunswick. — In the spring of 1947, Mr. R. B. Ronalds of Bathurst, New Brunswick, wrote to me that he had observed birds on his farm which, because of their behaviour, he believed to be cowbirds. On June 12 of that year I visited Mr. Ronalds' farm and observed three cowbirds *(Molothrus ater)* — two males and a female. One of the males was collected on that date. Mr. Ronalds reported that he had first observed the birds late in May of that year. On May 31, 1948, I observed a flock of five on the same farm. This, I believe, represents the first record of the occurrence of the cowbird in Gloucester County, New Brunswick. — AUSTIN W. CAMERON, Port Hood, N. S.

Additional Specimens of Pitymys pinetorum scalopsoides for Elgin County, Ontario. — In the Canadian Field-Naturalist for March, 1937, Elson describes the taking of three specimens of the pine mouse *(Pitymys pinetorum scalopsoides)* near Eden, in the eastern part of Elgin County, Ontario. Since then the writer has trapped several specimens near St. Thomas, 25 miles west, and the purpose of this note is to put the data on record.

The two areas in which specimens were taken are situated on the Catfish Creek, about a mile apart, and consist of open, deciduous woodland, grown with some grass, weeds and brush.

The first specimen was trapped on August 31, 1941, in Lot 23, Concession 5, Yarmouth Township. The trap had been set across a shallow runway, and the specimen, a female, measured L. 121, T.V. 19, H.F. 17. Subsequent trapping over the same ground has produced the following:

October 16, 1941 — male — L. 113* T.V. 7* H.F. 16.
November 9, 1941 — female — L. 110, T.V. 18, H.F. 17. (collected by Donald Young).
May 3, 1942 — male — L. 111, T.V. 20, H.F. 16.
August 25, 1946 — female — L. 118, T.V. 21, H.F. 16.5.
June 20, 1948 — female — L. 106, T.V. 20, H.F. 16.5.
June 20, 1948 — male — L. 112, T.V. 19, H.F. 17.
June 20, 1948 — male — L. 115, T.V. 17, H.F. 16.

All the above are in the collection of the Royal Ontario Museum of Zoology, Toronto, except the last four which are still in the writer's possession.

On September 20, 1941, a trap-line was set out further up the Catfish Creek, in Lot 24, Concession 7, Yarmouth Township. The snapping of a trap which he had set only a few minutes before, attracted the writer's attention, and an examination revealed that a male *Pitymys*, measuring L. 120, T.V. 20, H.F. 17.5 had already been caught. The following morning there were two more, but one had been eaten so badly (presumably by *Blarina*, which also inhabited the runways), that it was not saved. The other, a female, measured L. 118, T.V. 21, H.F. 17.5. Both these specimens are now in the collection of the Royal Ontario Museum of Zoology.

* Tail damaged.

A month later, Mr. L. A. Prince and the writer visited the last-mentioned area again, intending to trap there, but wood-cutting operations had commenced and the spot was a shambles. More recently, a few traps set in likely looking runways on September 7, 1948, failed to catch any specimens, and as all the trees there have now been cut, leaving only an open field, it is unlikely that the animals have survived.

In trapping this animal, the writer has never taken any specimens on the surface of the ground, but always by setting the trap in the runway. These runways are easily confused with those made by *Blarina,* and as specimens of the latter are frequently taken in the same runway with the Pine Mouse, it is evident that both animals use them. The burrow can usually be traced by the breakage in the surface of the soil, either continuously or at intervals along its course. Frequently they can be found by feeling the surface of the ground for spots that cave in, and then tracing them by poking the finger through the soil between the burrow and the surface of the ground. The trap is set slightly below the floor of the runway, in an excavation made for the purpose. Care should be taken to place it deep enough, or the animal has a tendency to dig below the trap and escape. — RONALD C. BROOMAN, Kitchener, Ontario.

A Semi-Albino Eastern Evening Grosbeak in Quebec Region. — On February 11, 1943, the Quebec Provincial Museum acquired an adult female eastern evening grosbeak *(Hesperiphona v. vespertina)* which is semi-albino. It was shot at Beaupré, County Montmorency, about twenty-five miles below the City of Quebec.

In general, its colour is a dirty white, but the feathers of the hind neck and on the side of the body are a good pale yellow, while the breast and back are just tinted with yellow. The flight feathers and the tail feathers are a clear buff, with white spots similar to those of the normal bird. The measurements are the same as those of normal birds of this species, and the eyes are red. The specimen is now mounted, and forms an item in the Nature Exhibit of the Quebec Provincial Museum bearing *No. 3172.* — Mrs. GUSTAVE LANGELIER, Quebec, P.Q.

Caspian Tern and Ring-billed Gull colonies, Green Island, Prince Edward County, Ont. — On July 5, 1941, three of us visited the Common Tern *(Sterna hirundo)* colony on Gull Bar, off Waupoos, Prince Edward county, Ontario, for bird-banding purposes. In 3½ hours we banded 1200 Common Terns at this spot, before deciding to continue banding on Green Island, about three miles away. As local residents assured us that the birds on the island were of the same species, we took along a supply of bands for Common Terns only.

Imagine our feelings, after a hard row over three miles of rough water in our very awkward boat, on finding not Common Terns but a colony containing at least 50 pairs of Caspian Terns (*Hydroprogne caspia*) and fully 2000 adult Ring-billed Gulls (*Larus delawarensis*) caring for a flock of about 500 youngsters.

I returned to the mainland for the larger bands which had been left behind, but when I reached the island again most of the birds had taken to the water. Before leaving, however, we succeeded in banding a dozen young Caspian Terns and 50 young Ring-billed Gulls, but we could have banded four times as many of each species had we brought all of our bands in the first place. We saw also on Green Island, without being able to band them, a family of four Black Ducks and about 17 cormorants. There was no evidence of nesting of these two species.

A young Caspian Tern and two sets of eggs, and a young Ring-billed Gull and two sets of eggs, were collected from the island and sent to the Royal Ontario Museum.

On June 30, 1942, I again visited Gull Bar and Green Island. The breeding season appeared to have been earlier than usual, and the young birds were more developed than at the date of the previous visit. The Caspian Tern population on Green Island seemed to be about the same as in 1941, but Ring-billed Gulls were much more numerous. A single immature Herring Gull (*Larus argentatus*), too young to fly, was discovered among the Ring-billed Gulls and banded by me during the 1942 visit; no Herring Gulls of similar age had been seen in 1941.

On June 30 and July 1, 1946, on June 21, 1947, and on July 6, 1948, I again visited the region, but found on each occasion that high water had prevented nesting on either Green Island or Gull Bar.

A fairly large colony of Common Terns, however, was observed nesting on the Blu

Island, off Presqu'ile Point, on July 5, 1948. We banded 334 young Common Terns there, and also took a young Ring-billed Gull, about two-thirds grown.—HERBERT H. SOUTHAM, 16 Normandy Boulevard, Toronto 8, Ontario.

First Record for White Pelican in Nova Scotia. — On September 27, 1948, a flock of 12 White Pelicans *(Pelecanus erythrorhynchos)* suddenly appeared in the muddy tidal waters at the mouth of the Gaspereau River in Kings County, Nova Scotia, near the Covred Bridge a well known land mark. The fact of their exceeding tameness was evidence that they were in trouble. Men working on the bridge chased them in a row-boat and all but succeeded in lassoing them with an improvised rope. Two days later the writer was called to the Cornwallis River at Port Williams where a flock of 16 of these birds was seen, closely bunched, floating in the muddy tidal waters below the iron bridge which spans the river at that point. These likewise were very tame. The birds examined by the writer were emaciated, some in a more advanced state than others. In all 16 dead pelicans were accounted for between Sept. 27 and Oct. 15 and it was roughly estimated that about 50 individuals came to this restricted area. None was reported from other parts of the Province. About Oct. 1, a pair was reported as seen catching minnows in a shallow creek on the Grand Pre meadows and on October 6, a pair was seen sitting on the meadow below Wolfville. At the writer's approach these flushed at about 100 yards and flew off out of sight on strong wing. On October 15, the opening date of the duck season, one was seen to "run the gauntlet" of no less than four occupied duck-blinds and well within range but not a shot was fired. We feel that this is a tribute to the calibre of the hunters in the blinds. None was reported after that date. This is the first and only record for the species in Nova Scotia that we have been able to find. It is believed that they were borne here on the wings of a hurricane which came up from the south along the Atlantic seaboard just prior to their sudden appearance noted above. — R. W. TUFTS, Wolfville, Nova Scotia.

Downingia laeta Greene and Megalodonta Beckii (Torr.) Greene from British Columbia. — Among the rare or interesting aquatic and marsh plants which in late years have been submitted for determination or verification by Mr. J. A. Munro, Dominion Wildlife Officer for British Columbia, of Okanagan Landing, B.C., is what proved a second Canadian record of *Downingia laeta.*

This rare species (and genus) I recently recorded as new to Canada in vol. 54:69 (1940) of this journal, from three previously unnamed collections in the National Herbarium of Canada, made by John Macoun, in 1894, at Crane Lake, Sask.

Mr. Munro found *Downingia laeta* growing in large patches, covering several hundred square yards, on the exposed muddy shores of Leach Lake near Creston, between the water's edge and a *Carex* marsh. Associated with it were *Sagittaria* sp. and *Eleocharis acicularis.* A single specimen, now in the National Herbarium, Ottawa, is in full flower, and was collected on Sept. 12, 1948.

Megalodonta (Bidens) Beckii was collected on Aug. 16, 1947 in the shallow water of a small lake on the Kootenay Flats, near Creston, where it grew in patches approximately 15 by 50 yards large.

Mr. Munro noted "that vegetation along the shore of this lake, is pure *Equisetum* [*limosum*] followed by a belt of tall *Sagittaria* sp. and *Alisma* sp. which again is followed by a dense growth of *Potamogeton pectinatus, P. Richardsonii, P. zosteriformis, Anacharis* [*Elodea*] *canadensis* and *Myriophyllum* sp. Finally, the central and greater portion of the lake is dominated by an almost pure growth of *Potamogeton Robbinsii".*

The British Columbia station for *Megalodonta Beckii* constitutes a very considerable extension of the known range for this species which in recent manuals is usually stated to be: "Maine and Que. west to Man., south to N.Y. and Mo."

Mr. Munro states that *Downingia* and *Megalodonta* both grew on parts of the Kootenay Flats which are subject to flooding each year, and that their occurrence there in no way suggests an artificial or recent introduction but that seeds may have been carried by flood waters from the upper reaches of the Kootenay in Montana or Idaho.

Specimens of *Megalodonta Beckii* from Kootenay Flats are in the Provincial Museum of Natural History, Victoria, B.C., and in the National Herbarium, Ottawa. — A. E. PORSILD, Ottawa.

Swallow-tailed Kite in Nova Scotia. — Following the death a few years ago of Harry Piers who was Curator of the Provincial Museum at Halifax over a long period, his ornithological records came into my possession. Among these I found remnants of an exchange of correspondence which showed that back in 1907 he had tried to purchase for the Museum a mounted specimen of the

Swallow-tailed Kite *(Elanoides forficatus forficatus)* from one Adelbert Wilson of Lower East Pubnico, Yarmouth County. The correspondence broke down when Mr. Wilson held out for an exhorbitant price for the specimen. When passing through this little village in July, 1945, I made enquiries and learned that Mr. Wilson had died many years ago but that his aged widow was still living there with relatives. On a chance that she might remember the incident of the bird's capture I called and was delighted to learn that she not only remembered it but that it still rested on the piano. Though the specimen was considerably the worse for wear it was quite intact and I had no difficulty in purchasing it at a fair price. Concerning the bird she was able distinctly to recall that it was during the late summer, probably August, that her small daughter saw this strange looking bird on the ground being mobbed by a number of smaller birds. Later the same day it was found dead nearby and Mr. Wilson sent it to Benjamin Doane, taxidermist at Yarmouth, for mounting. The specimen is now in the Provincial Museum at Halifax and constitutes the only occurrence of the bird for Nova Scotia, of which I have knowledge. — R. W. TUFTS, Wolfville, N.S.

Eastern Glossy Ibis in Nova Scotia. — On May 10, 1946, a flock of seven Eastern Glossy Ibises *(Plegadis falcinellus falcinellus)* were seen to alight in a wet meadow near White Point Beach in Queens County, Nova Scotia. One of them was shot by a local resident who realized that they were strangers. The bird was sent to me in the flesh. This bird, a male, weighed 1 lb. 6 oz. and its length was 23⅞ inches. The specimen was mounted and may be seen in the Provincial Museum at Halifax. Other Nova Scotia records for this species which are recorded by me are:

> "Two taken at Pictou in 1910 by the late Scott Dawson who for many years practiced taxidermy in Pictou. In telling me of the incident he added that several more were seen at the time he collected these."
>
> "About 1865 one was taken, likewise at Pictou and reported to me by the late P. A. Taverner." — R. W. TUFTS, Wolfville, N.S.

The European Starling in the Canadian Rockies. — On June 14, 1948, I observed two adult European Starlings *(Sturnus vulgaris)* at close range through X6 binoculars in the buffalo enclosure at Banff National Park, Alberta. One of the birds was watched as it gathered nest material on the ground, but was lost when it flew into a stand of aspen near the centre of the compound. Owing to restrictions which prohibit walking about near the buffaloes, no search was made for the nest, but it seemed likely that the starlings had found a suitable site in one of the log shelters provided for the animals. Apparently this pair was successful in rearing their brood, for I was told of a small group of starlings being seen in the same enclosure in August.

That this species is ranging along the eastern slope of the Rockies in increasing numbers is indicated by two additional records. A small flock of about six birds was seen by Forest Ranger Delbert Hereford at The Gap Ranger Station, about 20 miles north of Coleman, in late March, 1948. He shot one specimen and confirmed his sight identification from Taverner's "Birds of Canada". The remainder of the flock left the station soon afterwards and did not return.

The third record is from the Forestry Experimental Station near Seebe, approximately 45 miles west of Calgary, where I picked up the desiccated carcass of an adult starling in spring plumage on October 12, 1948. The excellent condition of the feathers suggests that the bird had died in the shelter of one of the camp buildings, and had been dislodged and blown into the open by the high winds which occurred frequently during the autumn. I stayed at Seebe on several occasions throughout the summer but saw no starlings; this individual was probably a member of a flock attempting to penetrate the mountain barrier in early spring. — JAMES GRANT, Forest Insect Field Station, SEEBE, Alberta.

Golden-crowned Kinglet Wintering Near the Mattawa River, Ontario.—On December 23, 1948, I observed two Golden-crowned Kinglets, *Regulus satrapa*, feeding in the trees along Highway 17. The record was mentioned as of species seen within a week of my Christmas Census and, at that time, I believed the birds to be very late stragglers from the fall migration. But on February 18, 1949, I again came upon a Golden-crowned Kinglet at a spring near our home. Amid two feet of snow covering the woods, this bird was bathing vigorously in the overflow of the spring which never freezes. After the bath it flew up into a tree. Here a beam of sunshine struck the bird from behind and shone through the webbings of its spread wings

and tail and sparkled in a little cascade of waterdrops which the bird briskly shook from its plumage. Apparently greatly refreshed, the bird then flew off gaily into the woods." During the preceding night the temperature had dipped to 10 below zero, but at the time of the bath, 10.30 in the morning, it was 43 degrees Fahrenheit. I believe this is a first record of stray birds of the species wintering so far north in Ontario.—LOUISE DE KIRILINE LAWRENCE, Rutherglen, Ontario.

REVIEWS

Studies in Freshwater Fishery Biology. *By Karl F. Lagler. 240 p. 8½ x 11, numerous illustrations, including 50 half-tones. $4.00. J. W. Edwards, Ann Harbor, Mich. 3rd revised edition. 1949.*

This was devised primarily as a teaching manual but is valuable as a reference work for students and others interested in fishery biology. It includes accounts of anatomy, embryology, reproductive habits, food habits, age and growth studies including the scale method of age and growth determintion, population estimates, pathology, surveys, and fish culture. There are chapters on stream improvement and improvement of lakes, ponds and impoundments.

The book should constitute a part of the library of everyone concerned with the study and management of freshwater fisheries. — J. R. DYMOND.

The Ten-Year Cycle. *By William Rowan, Department of Extension, University of Alberta, Edmonton, Alberta, July, 1948, 15 pp.*

This pamphlet, prepared for the information of Alberta sportsmen and based largely on Alberta observations, describes the ten-year cycle in numerical fluctuations of bird and mammal populations. The author says, "The most celebrated members of this cycling fraternity include (beside rabbits) practically all the members of the grouse family, the Hungarian partridge, probably the pheasant, the magpie, almost certainly evening grosbeak and bluejay, as well as the majority of fur-bearers..." That the introduced Hungarian partridge and the ring-necked pheasant are said to have fallen in with a ten-year cycle is interesting and significant, although data presented are rather too few to eliminate coincidence entirely.

Figures given to illustrate the abundance of certain animals during peak years in Alberta indicate surprisingly dense populations at these times. A concentration of an estimated 10,000 varying hares on 1½ acres of land (the equivalent of about 1.4 animals per square yard!) is amazing. The paper contains much interesting, first-hand information and is illustrated by the author. — W. EARL GODFREY.

Fluctuations in Animal Populations with Special Reference to Those of Canada. *By J. R. Dymond. Transactions of the Royal Society of Canada, 1947, Vol. XLI, Sec. V, 34 pp., 2 figs., 3 tables. (Contributions of the Royal Ontario Museum of Zoology, No. 29. Twenty-five cents).*

This is an unusually well-documented digest of present information on aspects of numerical fluctuations in Canadian wild animal populations and the perplexing problems arising from these fluctuations. Phases of the subject treated include: the nature of periodic and non-periodic fluctuations, causes of non-periodic fluctuations, causes of periodicities in population fluctuations, emigration and disease as factors, emigration phenomena, periodicity in attainment of high population levels, periodicity in salmon populations, the importance of population studies, and a summary of the work currently being done in Canada. There is a useful list of references at the end of the paper.

The author concludes that few fields of zoological research offer better opportunities for making contributions of both practical and theoretical importance than does the field of animal populations and the factors affecting them. He emphasizes the need of considerable extension and improvement of present studies and recommends:

1. Provision for better commercial fisheries and fur statistics and the continuous, consistent recording of them.
2. The undertaking of studies designed to improve the accuracy of censusing aquatic and terrestrial animals.
3. Making and recording annual censuses over a long period of years of a number of important mammals, birds, fish, insects, and other animals.
4. Greatly increased study of the parasites and diseases of animals in nature. — W. EARL GODFREY.

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PLANTS OF CLEARING AND TRAIL BETWEEN PEACE RIVER AND FORT VERMILION, ALBERTA[1,2]

HERBERT GROH

Division of Botany and Plant Pathology, Department of Agriculture, Ottawa.

BETWEEN August 17 and 27, 1946, a rapid reconnaissance of the vascular plants, particularly the weeds, was carried out from Peace River town to Fort Vermilion about two degrees latitude to the north (Figs. 1, 2). Weed listings from 23 sites were accompanied by observations on general vegetation and crops. Collections to the extent of some 180 numbers were made of significant plants or plants of uncertain identification in the field. Such a brief survey cannot provide a flora or even an adequate weed appraisal, but, in view of the extreme dearth of botanical information from this particular sector, the findings, however incomplete, should be made available.

On the way downstream by regular boat service, the first opportunity to get ashore was at the little trading post of Carcajou. Here, over 60 species of more or less concern as weeds were noted in the clearing, the more interesting ones being collected. At other landings shorter lists were secured in the time available. Two full days in the Fort Vermilion district under the tireless direction of the Superintendent of the Dominion Experimental Sub-station, Mr. Victor J. Lowe, served to carry the survey to almost every part of this amazing outpost of agriculture. On the return journey the survey was continued at the landing opposite Carcajou. In the company of the mail courier between that point and Keg River, on a twelve-hour, forty-mile drive by wagon and team, there was opportunity to become familiar with the more prominent features of the native cover. A cabin and clearing midway, at Keg River Crossing, provided about the only centre of introduced weeds in the almost untouched wilderness. Two busy days at Keg River drew profitably on the keen co-operation of Mr. and Mrs. (Dr.) Jackson and family, pioneers of this productive prairie along the Grimshaw-Slave Lake Trail (soon now to be highway). Another day at Notikewin completed the survey with the exception of what could still be observed from the bus out to Grimshaw and Peace River.

Space need not be taken for any formal discussion of the history, topography, soils, geology, climate and general vegetation of the region, since this has been done adequately by Raup (6). Between Peace River and Fort Vermilion most of the country can be described as high, rolling prairie or parkland, covered more or less by poplar and willow. Most of the landings visited are mere fringes of clearing along the shore and are of little account agriculturally except to serve a sparse population inland that has always some livestock or other produce to market in exchange for essentials from outside. Remote and pioneer as they are, these places, like the larger settlements, have already filled up over the years with a characteristic weed association. This association comprises the more intrusive elements of the weed population of Canada at large.

Fort Vermilion, Keg River and Notikewin are more substantial agricultural communities, only needing the better marketing facilities that are now on the way to realization to enable them to contribute their full quota to the nation's economic life. The crops produced in the short, intense growing season are rather closely parallel to those of any other part of the Dominion. With the ample precipitation of the past year (1945), they were the equal in yield of any to be seen elsewhere, and for the most part had matured by the time frost came. For over a half century wheat has been grown successfully at Fort Vermilion. "Two striking farms, a few

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[2] Contribution No. 945 from the Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa, Ontario.

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miles up river, the Lawrence Farm at Lawrence Point and the Jones Farm at Stoney Point, have for twenty years been producing all varieties of grains and vegetables" (3). The gardens of the Mackenzie River as a whole have become famous (1) and, as seen here, were a revelation. Mr. and Mrs. Sheridan Lawrence are now living retired at Peace River where a half hour was spent with them very pleasantly.

Recent explorations by Raup both above and below this portion of the Peace River and his phytogeographic studies, with catalogue (4) of his own and other collections from the entire area, are the principal source of earlier data at hand. Unfortunately for the present purpose, Raup's passage by canoe over this part of the river had to be a hurried one and apparently his collecting was confined to a station about 10 miles above the Carcajou Indian Settlement where less than 50 species were collected. Of these only a few, when occurring in settlements, would be regarded as weeds and none, unless *Chenopodium album,* which appears rather like a native form, could possibly be suspected of being adventive. Inasmuch as Raup attempted fully to review past work no further search for published records has been undertaken. John Macoun undoubtedly traversed this stretch of the river but his specimens, if any, must have been among a lot which was lost. In 1903, J. M. Macoun, with William Spreadborough as assistant, spent some time in studying the agricultural resources of Fort Vermilion and the upper Peace regions, and made a few collections at Wolverine Point, near Carcajou, and at White Mud River. Again, in 1931, E. H. Moss, in the course of a trip by automobile through the Peace River agricultural district, penetrated this area as far as Notikewin. The few specimens from these points are cited in the aforementioned catalogue.

Of the earlier explorers some may have passed this way but it is doubtful whether any of their collections, as recorded in Hooker's (2) or Macoun's (4) great works, were from here. Their itineraries, and particularly those of Raup in adjacent parts, contribute wonderfully to an understanding of the vegetation but obviously, from the routes travelled and the different nature of their quest, they give but little indication of the present flora of the settlements. The changes already wrought on the indigenous flora and the attendant advent of alien species are alike of intense interest to the weed geographer.

A bare listing of the weeds of a region can be useful in itself. In the present study such a treatment would be difficult, not because of any undue number of species but because many of the species are plants of the native flora still persisting and as yet of doubtful permanent weed status. A list of adventive plants maintaining themselves more or less aggressively is a simpler matter, and is provided in Table 1 along with such indigenous species as are of distinctly weed character. This table is more than a list, since it attempts also an evaluation in terms of both frequency and abundance and arranges the names in order of the combined value of these factors. It is a first tentative answer to the inevitable query: "Which are the worst (in this case the commonest) weeds?" Later answers may be expected to indict other aggressors not yet so prominent. Prefacing the use of the figures appearing in the table and catalogue some explanation of method is desirable.

Method

At each of the 23 sites where observations were made lists were compiled of the weeds in the order seen. These simple lists provide the data for several distinct uses, as will be noted on reference to the table where, for example ,the first column indicates the species occurring in the region.

As a species is repeated in the listings along the route, a mere record of occurrence becomes a record setting up the order of frequency in the table. Some species repeat regularly, others more rarely, so the percentage of all the lists in which the weed is found becomes the index of frequency. Thus, yarrow the only species in all 23 lists, stands first, or 100 per cent; lamb's quarters in 22 lists stands second, with 95.6 per cent frequency; while others in one list only have a frequency of 4.3 per cent of the surveys.

A weed is only recorded once in a list and no direct indication is conveyed of abundance. Such suppementary information about it can be obtained fairly well, however, from a consideration of the weed's position in the lists. If ordinarily recorded early it is obviously more abundant than if usually recorded late in the survey or only in some lists. This third function of the data comes into operation as the several list positions of the weed are averaged; the lowest numerical average indicating greatest abundance. When a weed is absent from one or more lists it is only necessary to give it arbitrarily a list position of, say 100 each time, to cancel the reversing

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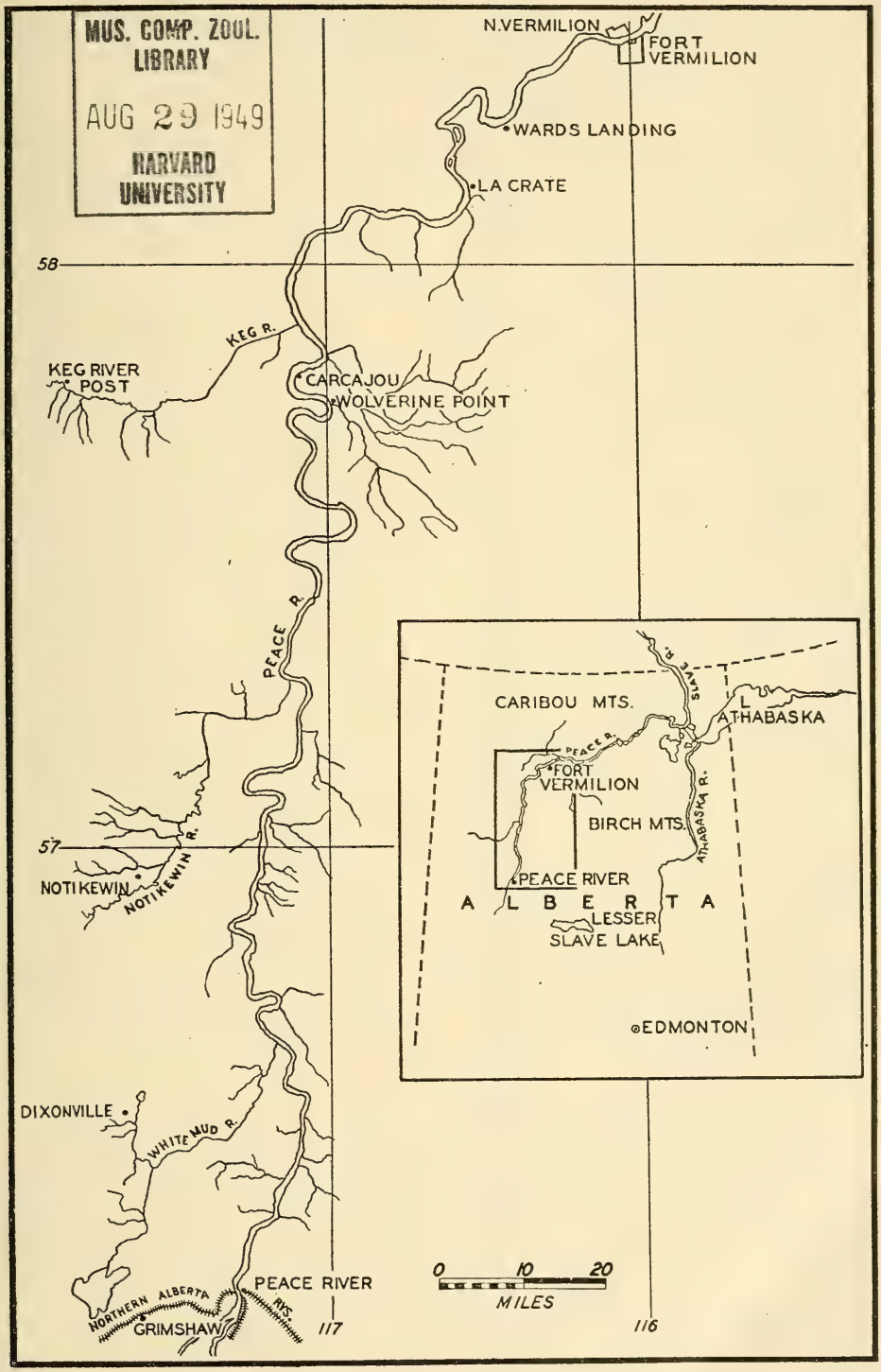

Fig. 1. Map of the Peace River — Fort Vermilion district, Alberta.

Table 1. Weeds of the region in order of frequency and abundance, 1946.

Includes both adventive and indigenous species.
For botanical names and comment see catalogue following.

	Indigenous or Adventive	Order of Frequency	Order of Abundance	Combined Value
Common Yarrow	Ind.	1	1	1
Lamb's Quarters	Ind.	2	2	2
Wild Barley	Ind.	4	3	3
Biennial Wormwood	Ind.	3	4	3
Peppergrass	Ind.	5	6	5
Fireweed	Ind.	6	7	6
Erect Knotgrass	Ind.	7	8	7
Field Horsetail	Ind.	11	11	8
Awnless Brome Grass	Adv.	12	10	8
Common Plantain	Ind.	14	15	10
Shepherd's Purse	Adv.	15	17	11
Russian Pigweed	Adv.	20	19	12
Ball Mustard	Adv.	20	19	12
Wild Buckwheat	Adv.	19	20	12
Upright Cinquefoil	Ind.	22	22	15
Common Knotgrass	Ind.	27	18	16
Dandelion	Adv.	31	16	17
Blue Lettuce	Ind.	24	26	18
Flixweed	Adv.	23	29	19
Wormseed Mustard	Ind.	25	30	20
White Sweet Clover	Adv.	33	23	21
Stinkweed	Adv.	32	32	22
Timothy	Adv.	28	37	23
False Flax	Adv.	33	38	24
Pineappleweed	Adv.	37	42	25
Yellow Sweet Clover	Adv.	In 7 lists		
Blue Bur	Ind.	7		
Flax	Adv.	6		
Wild Oats	Adv.	6		
Canada Fleabane	Ind.	5		
American Dragonhead	Ind.	5		
Alfalfa	Adv.	4		
Thyme-flowered Dragonhead	Adv.	4		
Sweet Grass	Ind.	3		
Spiny Annual Sow Thistle	Adv.	2		
Indian Mustard	Adv.	2		
Tumbleweed	Ind. here?	1		
Couch Grass	Adv.	1		
Wild Mustard	Adv.	1		
Tumbling Mustard	Adv.	1		
Perennial Sow Thistle	Adv.	1		
Leafy Spurge	Adv.	1		
Narrow-leaved Hawksbeard	Adv.	1		
Green Foxtail	Adv.	1		
Purslane	Adv.	1		
Canada Blue Grass	Adv.	1		
Grey Tansy Mustard	Ind. here?	1		
Green Tansy Mustard	Ind. here?	1		
Red Clover	Adv.	1		
Crested Wheat-grass	Adv.	1		
Asparagus	Adv.	1		
Climbing Fumitory	Adv.	1		
Cornflower	Adv.	1		

effect of leaving it zero. Thus, yarrow is again first with a standing of 1 from the two appraisals together. Wild barley and biennial wormwood are third or fourth according to which measure is used, while dandelion, lower in the table, is distinctly more abundant than frequency would indicate. In ordinary practice abundance or scarcity has been assigned on the personal judgment, good or bad, of the observer. By the method used here the results for abundance or frequency are as free of personal bias as it is possible to have them.

Discussion of Table

Much of the discussion required finds its proper place in the individual treatment of species to follow, but a word or two regarding the table herewith will not be amiss. It will be seen that all the top-ranking weeds are indigenous to the country. Adventive species are either too recent, or less perfectly adaptable to their new home, to have reached the top as some of them may have done elsewhere. Shepherd's purse, Russian pigweed, wild buckwheat and ball mustard are in the vanguard of those that have multiplied to a point where their competition challenges the supremacy of the original vegetation. It is significant that these and the majority of the alien species following are annuals. The more slowly penetrating perennials are led by one species, awnless brome grass, which besides being perfectly adapted to entrenching itself, has had every assistance agriculturally to do so. Couch grass, perennial sow thistle, leafy spurge and a few perennial grasses have arrived and give early indication of making their way if permitted. An impressive further revelation of the table concerns the multitude of species present in the rest of Canada that are still absent from this area or, if present, are awaiting closer survey for their discovery.

The Catalogue

The remainder of this paper is a briefly annotated catalogue including also plants other than weeds which happened to attract attention and can contribute to a better understanding of the whole floristic setting. Where possible specimens are cited. Those collected by the writer appear by place and collector's number. Others, available from Raup's Catalogue (6), appear within quotation marks, the collections without collector's name being those of Raup and the remainder those of J. M. Macoun or E. H. Moss, as indicated. About 175 species are thus obtained. Not only the plants of his Catalogue but many of those of the present survey have been examined by Dr. Raup. Of the plants recorded in the lists but not collected, the majority are weeds, trees or other species about the identity of which there was little room for doubt; in such cases they have been admitted for what value they have as records. One further elaboration of the ordinary catalogue is the inclusion of frequency of occurrence in the 23 survey lists to give some indication of the present prevalence of a weed or other plant.

Catalogue of Species

EQUISETACEAE

Equisetum arvense L.

COMMON HORSETAIL. Occurs in 20 of 23 survey lists. The same meridian here, and in surveys farther south in the Peace-Athabaska belt, showed higher incidence than was found farther west. Where natural drainage is poor, as in the High Prairie region, the weed becomes a major problem; and anywhere, until pioneer conditions have passed, it belongs in a weed list. The known harmfulness to horses of this and other species of horsetail has also to be considered. A native deep-rooting perennial.

Equisetum pratense Ehrh.

MEADOW HORSETAIL. In 5 lists. Fort Vermilion, 1907, *Lawrence*. By Raup reported throughout adjacent areas especially on river flood-plains.

Equisetum sylvaticum L. var. **pauciramosum** Milde.

WOODLAND HORSETAIL. The species four times reported, in no case north of Carcajou and Keg River, although by Raup collected in Wood Buffalo Park. Canadian surveys in general have found it in constant amount between Lat. 55° and 57°, but in steadily decreasing incidence southward. Keg River *2444;* at least this specimen, the variety.

PINACEAE

Picea glauca Voss.

WHITE SPRUCE. A predominant tree, one of a limited number in the North. "Woods along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, nos. *4390, 4391* (tall trees 60-80 ft. high)."

Picea mariana (Mill.) B.S.P.

BLACK SPRUCE. The tree of muskegs.

Pinus Banksiana Lamb.

JACK PINE. On sandy ridges, one such across North Fort Vermilion. La Crate *2902.*

Juniperus horizontalis Moench.

CREEPING JUNIPER. "Bluff along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, *No. 4389.*"

TYPHACEAE

Typha latifolia L.
CAT-TAIL. Observed in three surveys all in the southern part, but not actually so restricted. A water weed.

SCHEUCHZERIACEAE

Triglochin maritima L.
ARROW-GRASS. Recorded only once north of Peace River, this supported by specimen, North Fort Vermilion *2895*. Poisonous to sheep and cattle eating it owing to development of hydrocyanic acid.

GRAMINEAE

Bromus Pumpellianus Scribn.
"Bluff along Peace R., about 10 mi. above Carcajou Settlement, Aug. 15, No. *4361*."
Bromus inermis Leyss.
AWNLESS BROME GRASS. In 19 lists. Keg River *2856*. Introduced throughout and a real agricultural asset. To be regarded as a weed only when its strongly creeping rhizomes have to make way for another crop.
Glyceria pulchella (Nash) K. Sch.
"Slough along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, No. *4357*."
Poa compressa L.
CANADA BLUE GRASS. Twice recorded, at Carcajou and Fort Vermilion. When fully introduced it will be found of importance as a perennial weed, although also a nutritious and palatable grass.
Poa glauca L.
"Dry bluff along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, No. *4367*."
Poa palustris L.
FOWL MEADOW GRASS. In 17 lists uniformly distributed in the moister locations. Notikewin *2877*. Locally sometimes mistaken for red-top which does not occur. Perennial, but perhaps less tenacious than the blue grasses.
Poa pratensis L.
KENTUCKY BLUE GRASS. In 8 lists. Specimens: Carcajou *2794;* Keg River *2859*. More often of grazing value than objectionable as a weed. It can persist, however, in fields or gardens not too well tilled, as it has a strong creeping root system.
Poa interior Rydb.
INLAND BLUE GRASS. North Fort Vermilion *2829*. Specimen so identified by Mr. J. R. Swallen, Washington, D.C. This and one of his own, "Dry bluff along Peace R., about 10 mi. above Carcajou Settlement, Aug. 15, No. *4373*," have been named by Dr. Raup, *Poa nemoralis* L., a closely related European species.
Distichlis stricta (Torr.) Rydb.
SALT GRASS. North Fort Vermilion *2836*, in salt slough.
Agropyron cristatum (L.) Gaertn.
CRESTED WHEAT-GRASS. At Fort Vermilion, where introduced and escaped.
Agropyron trachycaulum (Link) Malte var. **typicum** Fern.
SLENDER WHEAT-GRASS. WESTERN RYE-GRASS. In 20 lists. Keg River *2855*. "Dry bluff along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, No. *4376*." Although so generally distributed here, this indigenous grass has been disappointing under culture for hay or pasture.
Agropyron trachycaulum (Link) Malte var. **glaucum** (Pease & Moore) Malte.
Keg River *2852*.
Agropyron trachycaulum (Link) Malte var. **unilaterale** (Cassidy) Malte.
"Dry bluff along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, No. *4375*."
Agropyron repens (L.) Beauv.
COUCH, QUACK or TWITCH GRASS. Recorded only at Carcajou where it has established itself in the clearing. From experience in the rest of the Peace River district it can be expected to invade the north generally, chiefly by its vegetative propagation which is slower than that of the freely seeding annuals. At the present stage prompt eradication of patches discovered is supremely important to avoid inevitable scattering.
Hordeum jubatum L.
WILD BARLEY. SQUIRREL-TAIL GRASS. In 21 lists and at least as prevalent as in the rest of the Peace River district. In clearings it is a nuisance; and on low prairies and especially around salt sloughs it often becomes the dominant vegetation. More valuable range grasses are crowded out sometimes in a very few years. While the plant is useful forage when young, at maturity the awns penetrate the membranes of animals grazing it, causing sores.
Koeleria cristata (L.) Pers.
JUNE GRASS. Seen in Fort Vermilion district and reported by Raup in Wood Buffalo Park as "one of the dominant grasses in the drier prairies on the uplands, and an important source of forage."
Avena fatua L. var. **glabrata** Peterm.
WILD OATS. In 6 lists representing all parts — Fort Vermilion, Carcajou, Keg River, Notikewin and south. In some instances amounting to heavy pollution of grain crops. As an impurity in seed grain, it would be an early immigrant which would be perpetuated in

land used too steadily for grain. Methods of control need to be formulated with special reference to local conditions, and might well be among the first weed problems to be attacked.

Calamagrostis canadensis (Michx.) Beauv.
BLUE-JOINT. Keg River *2857*. A tall, robust grass which yields a large part of the native wild hay. Land once broken remains free of it.

Agrostis scabra Willd.
HAIR GRASS. In 14 lists. North Fort Vermilion *2842;* Keg River *2853*. Often invading meadows of grass better than itself.

Alopecurus aequalis Sobol.
MARSH FOXTAIL. Notikewin *2869, 2972*. Occurrence is usually in places rather wet for cropping.

Phleum pratense L.
TIMOTHY. In 12 lists. Introduced but less conspicuous in the Fort Vermilion part of the area, and not a particularly successful hay grass here. Occasional in clearings and along trails.

Muhlenbergia squarrosa (Trin.) Rydb.
North Fort Vermilion *2831*.

Oryzopsis micrantha (Trin. & Rupr.) Thurb.
LITTLESEED RICE-GRASS. "Dry bluff along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, No. *4368*."

Stipa comata Trin. & Rupr.
PORCUPINE GRASS. Seen W. of Fort Vermilion in open poplar stand. "Dry river bluff along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, *No. 4366*." A good forage grass until its pointed grains become a menace to animals feeding on it.

Stipa viridula Trin.
NEEDLE GRASS. Seen with the preceding; like it often injurious to animals. "Dry bluff along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, No. *4366a*."

Beckmannia Syzigachne (Steud.) Fern.
SLOUGH GRASS. In 9 lists. Wards Landing *2847;* Keg River *2854*. "Slough along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, No. *4356*." Where it occurs it is commonly in close stands, but these are seldom on agricultural land.

Spartina gracilis Trin.
CORD GRASS. Recorded from saline slough, North Fort Vermilion.

Hierochloë odorata (L.) Wahl.
SWEET GRASS. VANILLA GRASS. Fort Vermilion Experimental Substation *2834 ;* Stoney Point, W. of Fort Vermilion *2835*. Also seen at Keg River. At this date only the mats of foliage were present to mark the dense, deep tangle of rootstocks beneath. Only deep and persistent tillage will ever subdue this weed.

Setaria viridis (L.) Beauv.
GREEN FOXTAIL. Fort Vermilion *2811*. An annual weed of arable land, already increasing in other parts of the Peace River district, and to be expected here. Its prevalence in commercial seeds ensures its wide distribution.

CYPERACEAE

Carex abbreviata Prescott.
TORREY'S SEDGE. "White Mud R. *J. M. Macoun No. 59537*."

Carex siccata Dewey.
HILLSIDE SEDGE. "White Mud Cr. *J. M. Macoun No. 59536*."

Carex laeviculmis Meinsh.
"White Mud R., *J. M. Macoun 59539*."

Carex atherodes Spreng.
MEADOW SEDGE. Keg River *2860*. Collected because of a severe smut infestation; otherwise sedges were not receiving attention.

Carex rostrata Stokes.
BEAKED SEDGE. "Slough along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, No. *4353*."

JUNCACEAE

Juncus Vaseyi Engelm.
VASEY'S RUSH. Notikewin *2864, 2865*. Roadsides.

LILIACEAE

Asparagus officinalis L.
ASPARAGUS. As an escape at Fort Vermilion Experimental Substation.

IRIDACEAE

Sisyrinchium angustifolium Mill.
BLUE-EYED GRASS. Keg River *2918*. "Wolverine Pt., *J.M. Macoun No. 61278*." On prairie.

SALICACEAE

Populus tremuloides Michx.
TREMBLING ASPEN. A characteristic tree of the region on uplands especially.

Populus balsamifera L.
BALSAM POPLAR. Also abundant with the preceding and on lowlands.

Salix spp.
WILLOWS. No particular attention was paid to the numerous species.

Salix pseudomonticola Ball.
"Slough margin along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, No. *4385* (tall shrub)."

BETULACEAE

Betula papyrifera Marsh.
WHITE BIRCH. Fort Vermilion *2827*. "Bluff

along Peace R., 10 mi. above Carcajou Settlement, Aug. 15, No. *4836* (trees 10-15 ft. high)." (var. *neoalaskana* (Sarg.) Raup). Once common; being the only hardwood, it has been almost exterminated from settlements. Except the above specimen, it was met here only as the posts of an old fence.

Betula glandulosa Michx.
DWARF BIRCH. North Fort Vermilion *2826*. "White Mud Cr., N. of Dunvegan, *J. M. Macoun* No. 61272." In thickets near a salt slough.

Alnus tenuifolia Nutt.
RIVER ALDER. Keg River *2910*. Abundant on shores throughout.

URTICACEAE

Urtica gracilis Ait.
SLENDER NETTLE. In 17 lists; throughout the region. Persisting in borders of clearings and objectionable chiefly on account of its stinging hairs.

SANTALACEAE

Comandra pallida A. DC.
BASTARD TOAD-FLAX. In 5 lists, all in Fort Vermilion district except one at Notikewin.

POLYGONACEAE

Rumex occidentalis S. Wats.
WESTERN DOCK. In 5 lists. Notikewin *2961*. At edge of slough, and not ordinarily a field weed.

Rumex mexicanus Meisn.
PALE-LEAVED DOCK. In 8 lists. Keg River *2915*. In moist waste places, probably the most nearly a weed of the docks occurring.

Rumex maritimus L. var. **fueginus** (Phil.) Dusen.
GOLDEN DOCK. Keg River *2923*. Wet places.

Polygonum achoreum Blake (*P. erectum* L.)
ERECT KNOTWEED. In 20 lists. Keg River *2919, 2953*. Everywhere in settlements, especially along trails. Annual and little apt to invade adjoining fields.

Polygonum aviculare L.
COMMON KNOTWEED. (Perhaps incl. separable *Avicularia)*. In 15 lists. Fort Vermilion *2841;* Keg River *2858, 2920, 2950*. Like the last in settlements, but infesting yards and paths, or clothing them with a mat of green where the surface is trampled too much for grass.

Polygonum natans A. Eat.
North Fort Vermilion *2808*.

Polygonum lapathifolium L. var. **salicifolium** Sibth.
PALE PERSICARY. La Crate *2806*. Also Fort Vermilion. In damp places and invading fields. Annual.

Polygonum Convolvulus L.
WILD BUCKWHEAT. BLACK BINDWEED (not the same as field bindweed). In 17 lists, spread over the entire area. An early immigrant arriving with feed and seed, or already with trapper's or explorer's packs, and promptly occupying cultivated ground. At present, one of several most abundant introduced weeds. Annual, free-seeding and making a tangle of crops.

CHENOPODIACEAE

Chenopodium capitatum (L.) Asch.
STRAWBERRY BLITE. In 7 lists mostly Fort Vermilion localities. Keg River *2954*. In settlements, often on burned-over portions, rarely in crops.

Chenopodium rubrum L.
RED GOOSEFOOT. In 4 lists. Keg River *2924*. Restricted to saline spots.

Chenopodium glaucum L.
OAK-LEAVED GOOSEFOOT. In 6 lists, all at points from Carcajou to and through Fort Vermilion district. In yards and saline areas.

Chenopodium hybridum L.
MAPLE-LEAVED GOOSEFOOT. At La Crate and on west side of river at Carcajou. A coarse weed in waste places.

Chenopodium album L.
LAMB'S QUARTERS (to many in the West, pigweed). In 22 lists; or in all except one restricted survey of a weedy field where, of all places, it might have been expected. Fort Vermilion *2816*. "Dry bluff along Peace R., about 10 mi. above Carcajou Settlement, Aug. 15, No. *4377*." Raup, in his treatments of the northwestern flora seems to accept lamb's quarters as indigenous here. It may be indigenous also, at least, in part in the East, although generally understood as adventive. In any case it behaves as a weed and, except for yarrow, is the most abundant weed throughout. It occurs in both naturally and man-made environment but, as known elsewhere ,mostly in arable land.

Chenopodium leptophyllum Nutt.
NARROW-LEAVED GOOSEFOOT. Observed at Carcajou, and on the dry hills at Peace River outside the scope of this study. Fort Vermilion *2814*.

Atriplex patula L.
ORACHE. In 3 lists — in the North Fort Vermilion district and Notikewin *2973*. Mostly in saline places, not in crops.

Monolepis Nuttalliana (Schultes) Greene.
SPEAR-LEAVED GOOSEFOOT. In Keg River, Carcajou and 3 Fort Vermilion lists. In some-

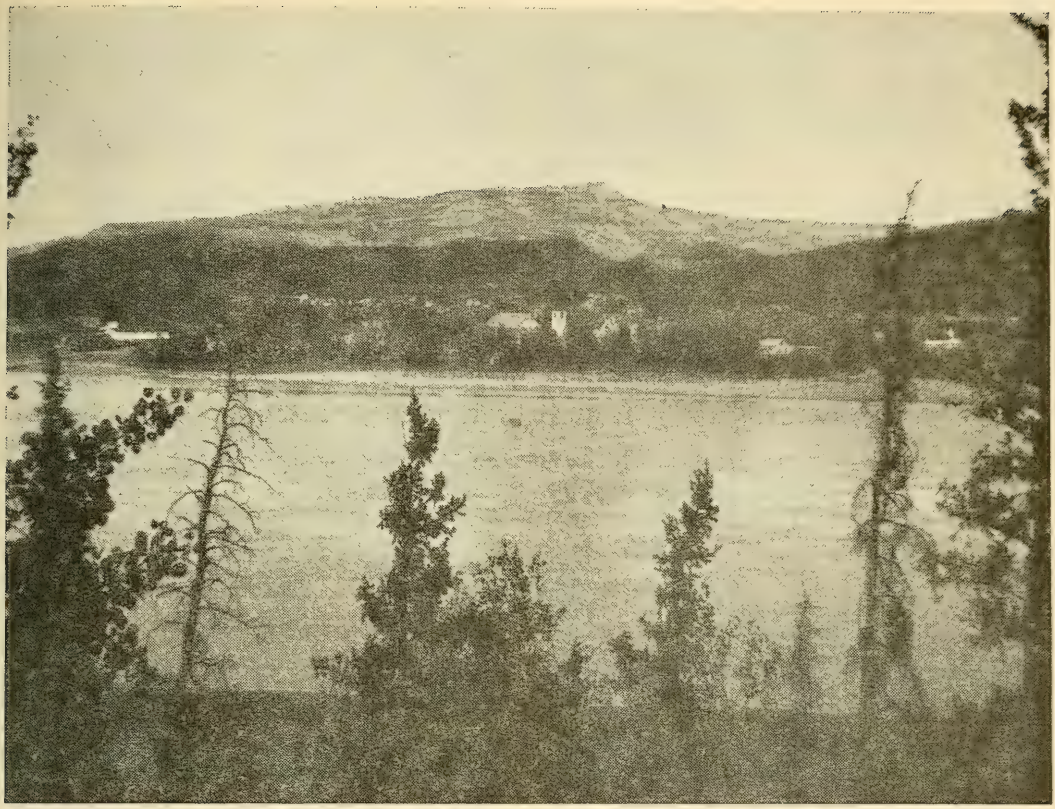

Fig. 2. Peace River and town. Starting point of survey to the north.

what alkaline conditions, only seldom in crops. Apparently not reaching the areas of Raup's lists.

Axyris amaranthoides L.

RUSSIAN PIGWEED. In 16 lists. La Crate Landing *2803;* Fort Vermilion *2809*. Nowhere, except in the upper Athabaska River and Lesser Slave Lake Region, has greater frequency anywhere been recorded, and abundance data are closely parallel. Among introduced annual weeds, only shepherd's purse and wild buckwheat are comparable, both of them no doubt of much less recent advent. This northwestern tendency in America appears to be a reflection of its Siberian origin. It will be interesting to watch its competitive efficiency later when the saturation point for adventives is more nearly reached. Since reaching Manitoba about 1885 it has increased and spread, but less in crops than on their borders and in waste places.

Salicornia europaea L.

GLASSWORT. SAMPHIRE. Stoney Point, W. of Fort Vermilion *3062;* also seen at Dixonville, S. of Notikewin. Around saline sloughs.

Suaeda depressa (Pursh) S. Wats.

SEA BLITE. North Fort Vermilion *2832*, at edge of slough and at settlement.

AMARANTHACEAE

Amaranthus (alba L.)

TUMBLEWEED ?. Recorded at Fort Vermilion Experimental Substation, but no specimen is found to support record. The nearest known station for an amaranth is at Peace River where *A. retroflexus* and *A. alba* L. were collected in 1934, and *A. graecizans* L. was recorded in 1946. *A retroflexus,* in the interval since, has overrun the gardens and vacant lots of the town. It is a native of tropical America; the others are indigenous in Western Canada although perhaps not so far north as this.

PORTULACACEAE

Portulaca oleracea L.

PURSLANE. Fort Vermilion Experimental Sub-station *3061*. It was found earlier 300 miles south at Beaverlodge, Alta. Evidently this pest of other parts is to be expected.

CARYOPHYLLACEAE

Stellaria longipes Goldie.

LONG-STALKED STITCHWORT. Keg River *2917.* "Notikewin, *Moss No. 2276.*" Numerous other citations in Raup's lists.

Stellaria longifolia Muhl.

LONG-LEAVED STITCHWORT. Fort Vermilion *2843.* Also recorded at Notikewin.

Cerastium arvense L.

FIELD CHICKWEED. In 4 lists. Notikewin *2868.* "White Mud R., N. of the Peace, *J. M. Macoun 59514.*" Forming close patches in prairie or grazing land.

Arenaria lateriflora L.

BLUNT-LEAVED SANDWORT. Notikewin *2867,* in open woods.

Melandrium Drummondii Porsild

DRUMMOND'S CAMPION. Carcajou *2796.* Reports not numerous along the Peace.

RANUNCULACEAE

Actaea rubra (Ait.) Willd.

RED BANEBERRY. In 4 lists. Fort Vermilion *2890;* Keg River *2905, 2907.* Wooded land. The berries poisonous.

Anemone canadensis L.

CANADA ANEMONE. In 4 lists. Scarcely a weed of agriculture.

Delphinium Brownii Rydb.

TALL LARKSPUR. Nine times reported in lists. Stoney Point, W. of Fort Vermilion *2839.* Potentially a cause of poisoning although reports of this have not been confirmed. Low larkspur does not reach here.

Pulsatilla ludoviciana (Nutt.) Heller.

PRAIRIE CROCUS. North Fort Vermilion *2828,* along a trail. At that late date no idea of real abundance would be obtained. Poisonous acridity and formation of its hairs into felty balls in the stomachs of sheep eating it sometimes result in losses.

Ranunculus Purshii Richards.

"Near Grimshaw, *Moss No. 2251.*"

Ranunculus abortivus L.

SMALL-FLOWERED BUTTERCUP. Keg River *2947,* in dry woods. An acrid plant.

Ranunculus sceleratus L.

"Slough along Peace R., about 10 m. above Carcajou Settlement, Aug. 15, No. *4352.*"

Ranunculus Macounii Britton.

MACOUN'S BUTTERCUP. Notikewin *2965.* No doubt often overlooked as it is absent from drained farm lands.

Ranunculus pedatifidus J. E. Sm. var. **cardiophyllus** (Hook.) Britton.

Keg River *2927.* Dry prairie.

Ranunculus trichophyllus Chaix.

WHITE WATER-CROWFOOT. Keg River Crossing *2850.* In shallow river bed, the bloom above the water an attractive sight.

Thalictrum sp.

MEADOW RUE. Keg River *2939.* In open woods.

Caltha natans Pall.

Notikewin *2974.* In bed and on borders of a shallow stream just west of town. This interesting species is known from Alaska to Minnesota but still only at rather wide intervals.

Caltha palustris L.

MARSH MARIGOLD. Seen once only, this at Keg River.

PAPAVERACEAE

Corydalis aurea Willd.

GOLDEN CORYDALIS. Recorded half a dozen times but without entire assurance that some (lacking flowers) may not have been *C. sempervirens* (L.) Pers.

Adlumia fungosa (Ait.) Greene.

CLIMBING FUMITORY. Fort Vermilion *2896.* Freely escaping from cultivation in garden.

CRUCIFERAE

Draba nemorosa L. var. **lejocarpa** Lindbl.

WOOD WHITLOW-GRASS. In 5 lists. Fort Vermilion *2815, 2844;* Carcajou *2797;* Keg River *2851.* Dry soil about settlements. Increasing sometimes to weed prevalence.

Lepidium densiflorum Schrad. *L. apetalum* Willd. in Raup's lists).

PEPPERGRASS. In 21 lists. Fort Vermilion *2884.* Roadsides and dry or packed ground.

Thlaspi arvense L.

STINKWEED. PENNYCRESS. In 21 lists. Rated either by frequency or abundance, this pernicious weed is already well established. It is imperative to prevent seed dispersal. Although an annual, some plants here probably, as in other districts, winter over ready to shed seed early before it would be expected. Once the soil is polluted, good coverage with vigorous crop will keep reproduction of the weed to a minimum.

Capsella Bursa-pastoris (L.) Medic.

SHEPHERD'S PURSE. In 18 lists. Fort Vermilion *2812.* About the commonest of the introduced weeds. In the early history of the Beaverlodge Experimental Station, it was considered the worst weed then being dealt with. Until the full quota of weeds arrives, it will be of similar importance here. It is a free-seeding annual or winter annual.

Camelina sativa (L.) Crantz.

FALSE FLAX. In 9 lists. La Crate *2805;* Notikewin *2957.* Adventive in clearings and likely to increase. A winter annual.

Neslia paniculata (L.) Desv.
BALL MUSTARD. In 16 lists. Bound to increase where grain is much grown. An introduced annual.

Brassica juncea (L.) Cosson.
INDIAN MUSTARD. One large plant at edge of grain field at Notikewin *2955*. Also seen at Carcajou. Adventive annual or winter annual. More usual in waste places than in crops.

Brassica Kaber (DC.) Wheeler var. **pinnatifida** (Stokes) Wheeler. (*B. arvensis* (L.) Ktze.).

WILD MUSTARD. CHARLOCK. Stray plants seen on two roads at Keg River, *2863*. Probably more frequent than this would indicate, and certain to increase in time. An annual weed prolific of seed and the seed of prolonged viability in the soil.

Descurainia pinnata (Walt.) Britton var. **brachycarpa** (Richards.) Fern.
GREEN TANSY MUSTARD. North Fort Vermilion *2807*. Also in the town. A native tansy mustard, common but seldom aggressive. Biennial.

Descurainia Richardsonii (Sweet) O. W. Schulz.
GREY TANSY MUSTARD. Notikewin *2866*. Also in town at Fort Vermilion. Weed of waste places. A native biennial.

Descurainia Sophia (L.) Wats.
FLIXWEED. In 15 lists throughout the region. Carcajou *2799;* Keg River *2912*. An introduction commonly confused with the native tansy mustards but vastly more abundant already than they and more to be feared. Dense stands winter over on arable land or, starting in spring crops, compete with them.

Sisymbrium altissimum L.
TUMBLING MUSTARD. Seen once at North Fort Vermilion. A waste place weed quite capable of crop invasion on lighter soil on the prairies.

Sisymbrium salsugineum Pall.
North Fort Vermilion *2845*. Growing in profusion along a trail near a salt slough. In flower.

Erysimum cheiranthoides L.
WORMSEED MUSTARD. In 15 lists. One of the most prevalent of native mustards. Annual or winter annual.

Erysimum parviflorum Nutt.
SMALL-FLOWERED PRAIRIE ROCKET. In two lists. In unbroken prairie.

Rorippa palustris (L.) Bess. var. **glabrata** (Lunell) Vict.
SMOOTH MARSH CRESS. In 8 lists. Fort Vermilion ferry *2885;* La Crate Landing *2804;* Keg River *2871, 2940*. In wet places.

Cardamine parviflora L. var. **arenicola** (Britton) O. E. Schultz. Notikewin *2873*. Numerous plants at edge of a grain field and looking like a weed. "Notikewin, Moss *2278*."

Arabis Drummondii Gray.
ROCK CRESS. In 10 lists as this or similar species. Keg River *2932*. In undisturbed prairie.

Arabis hirsuta (L.) Scop. var. **pycnocarpa** (Hopkins) Rollins. Keg River *2903;* Fort Vermilion *2837*. In native situations.

SAXIFRAGACEAE

Heuchera Richardsonii R. Br.
ALUM-ROOT. Seen at Notikewin. A native perennial.

Parnassia palustris L. var. **neogaea** Fern.
GRASS OF PARNASSUS. Keg River Crossing *2848*. Growing on moist shore.

Ribes hudsonianum Richards.
NORTHERN BLACK CURRANT. "Margin of slough along Peace R., about 10 mi. above Carcajou Settlement, Aug. 15, no. *4354*."

ROSACEAE

Amelanchier alnifolia Nutt.
SERVICE-BERRY. Seen in Fort Vermilion district. "Dry bluff along Peace R., about 10 mi. above Carcajou Settlement, Aug. 15, No. *4384*."

Rubus pubescens Raf.
Keg River *2941*.

Rubus strigosus Michx.
RED RASPBERRY. In 11 lists. Keg River *2942, 2943*. No attempt has been made to separate into two varieties under *R. idaeus* L., as has been lately customary. In one or two instances a peculiar "twinning" of fruits was more or less regular.

Fragaria glauca (Wats.) Rydb.
WILD STRAWBERRY. Notikewin *2956*, but noted elsewhere also.

Potentilla Anserina L.
SILVERWEED. In 8 lists. Moist places such as slough margins. In many cases both surfaces of leaves silvery.

Potentilla arguta Pursh.
WHITE CINQUEFOIL. In 8 lists. Keg River *2909*. Native perennial of dry prairies.

Potentilla gracilis Dougl. subsp. **Nuttallii** (Lehm.) Keck. Notikewin *2967*.

Potentilla norvegica L. var. **hirsuta** (Michx.) Lehm. (*P. monspeliensis* of authors.)

ROUGH CINQUEFOIL. In 16 lists. Probably native but with a definite weed status in settlements.

Potentilla palustris (L.) Scop.
MARSH CINQUEFOIL. Notikewin *2958*. Margin of pond.

Potentilla pennsylvanica L.
North Fort Vermilion *2894*. "Bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4362*."

Geum aleppicum Jacq. var. **strictum** (Ait.) Fern.
YELLOW AVENS. In 13 lists. Keg River *2925, 2926, 2946, 2949*. Common weed of roadsides in clearings; on dry soil.

Geum macrophyllum Willd. var. **perincisum** (Rydb.) Raup.
LARGE-LEAVED AVENS. Not always well distinguished from the last. In 8 lists. Keg River *2945*. Common on prairies and around sloughs.

Geum triflorum Pursh.
THREE-FLOWERED AVENS. Seen at Fort Vermilion.

Rosa acicularis Lindl.
In 20 lists. La Crate Landing *2901*. "Bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, *4381*."

Rosa Woodsii Lindl.
WOOD'S ROSE. "River bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4380*."

Prunus demissa (Nutt.) D. Dietr.
WESTERN CHOKE CHERRY. In 9 lists.

Prunus pennsylvanica L. f.
PIN CHERRY. BIRD CHERRY. In 5 lists. In drier situations than the preceding. "Bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, *4358*."

LEGUMINOSAE

Medicago sativa L.
ALFALFA. In 4 lists. Only where escaped from cultivation.

Melilotus alba Desf.
WHITE SWEET CLOVER. In 9 lists. Where introduced by agriculture.

Melilotus officinalis Lam.
YELLOW SWEET CLOVER. In 7 lists. Escaped to waysides.

Trifolium pratense L.
RED CLOVER. Seen only where escaped at Fort Vermilion Experimental Sub-station. Not apparently promising as an addition to the flora. In many parts of the Northwest alsike is the clover best naturalized, but here it was not noticed.

Astragalus hypoglottis L.
MILK VETCH. In 6 lists recorded as this. Notikewin *2870*. Dry prairie.

Astragalus tenellus Pursh.
LOOSE-FLOWERED MILK VETCH. "Dry bluff along Peace R., about 10 mi. above Carcajou Settlement, Aug. 15, No. *4369*."

Oxytropis retrorsa Fern. var. **sericea** (T. & G.) Fern.
LOCO-WEED. Carcajou *2798*. Also on the way out from Notikewin. Dry situations.

Oxytropis splendens Dougl.
In 5 lists.

Hedysarum alpinum L. var. **americanum** Michx.
North Fort Vermilion *2892*. Dry woods.

Vicia americana Muhl.
AMERICAN VETCH. In 18 lists. An abundant undergrowth in open woods and on prairie where it adds appreciably to available forage.

Lathyrus ochroleucus Hook.
PEA-VINE. In 10 lists. Stoney Point, W. of Fort Vermilion *2838*. Often with the last and equally useful for grazing.

GERANIACEAE

Geranium Bicknellii Britton
STORKSBILL. WILD GERANIUM. Seen at Notikewin. Open woods or on recently burned areas.

LINACEAE

Linum usitatissimum L.
FLAX. In 6 lists. Keg River *2876;* Notikewin *2959*. Scattered along waysides from seed brought in for crop purposes. Annual and probably able to reproduce itself.

EUPHORBIACEAE

Euphorbia Esula L.
LEAFY SPURGE. Fort Vermilion *2824*. Adjacent to airport on a roadside where it has been for a long enough time to have become an infestation about 35 feet by 7 feet in area. The original seed, however introduced, produced a colony extending by the very efficient root system but also by an explosive discharge of the seeds from the pods to some distance beyond existing borders. Not yet otherwise known north of the Edmonton district; therefore supremely important that eradication should be taken in hand as has been promised by the local official concerned in the matter.

ACERACEAE

Acer Negundo L.
MANITOBA MAPLE. BOX ELDER. Fort Vermilion, in town and at Experimental Substation. Planted and obviously adapted. Al-

most certain to spread and to be a nuisance on occasion as in other places.

BALSAMINACEAE

Impatiens biflora Walt.
JEWEL-WEED. Keg River *2906*. In woods.

VIOLACEAE

Viola adunca J. E. Smith
In 3 lists. Fort Vermilion, Keg River and Notikewin. Dry soil. "Base of dry bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4365*."

ELAEAGNACEAE

Elaeagnus argentea Pursh.
SILVERBERRY. "Dry bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4382*."
Shepherdia canadensis (L.) Nutt.
BUFFALO BERRY. Keg River *2948*. Not recorded when seen.

ONAGRACEAE

Epilobium angustifolium L.
FIREWEED. WILLOW-HERB. In 21 lists. In prairies, clearings and especially burned areas where it maintains temporary status as a weed. An attractive element of the northern landscape.
Epilobium glandulosum Lehm. var. **adenocaulon** (Haussk.) Fern.
NORTHERN WILLOW-HERB. Notikewin *2874*. In wet ground.

HIPPURIDACEAE

Hippuris vulgaris L.
MARE'S-TAIL. "Slough along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4355*."

UMBELLIFERAE

Cicuta Douglasii (DC.) Coult. & Rose
WATER HEMLOCK. In 5 lists. Lambert Point, E. of Fort Vermilion *2817;* La Crate *2802;* Notikewin *2963*. Deadly poisonous and no doubt responsible for losses of livestock in spring when it is most dangerous.
Sium suave Walt.
WATER PARSNIP. In 5 lists. Lambert Point, E. of Fort Vermilion *2818;* Notikewin *2970*. In wet places like the last, and believed to be also poisonous in some degree.
Zizia aptera (Gray) Fern.
GOLDEN ALEXANDERS. In 3 lists. North Fort Vermilion *2893*. Also at Notikewin.
Heracleum lanatum Michx.
COW PARSNIP. In 6 lists, none of them from northward. In thickets in drier locations than *Cicuta* and *Sium*.

CORNACEAE

Cornus stolonifera Michx.
RED-OSIER DOGWOOD. In 7 lists. Commonly fringing thickets. "Spruce woods along bank of Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4374*." (var. *Baileyi* (Coult. & Evans) Raup).

PYROLACEAE

Pyrola asarifolia Michx. var. **incarnata** (Fisch.) Fern.
Keg River *2930;* in poplar woods.

PRIMULACEAE

Androsace septentrionalis L.
In 6 lists. Carcajou *2795;* Keg River *2904;* Notikewin *2962*. On dry prairie. At Beaver-lodge a weed in light soil of fruit plantation.
Glaux maritima L.
SEA MILKWORT. Lambert Point, E. of Fort Vermilion *2822;* North Fort Vermilion *2891*. Around saline sloughs.

GENTIANACEAE

Gentiana Amarella L.
GENTIAN. Keg River Crossing *2934*, by woodland trail.

APOCYNACEAE

Apocynum androsaemifolium L.
SPREADING DOGBANE. In 8 lists, all between Carcajou and Fort Vermilion. In well-drained open places. "Bank of Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *49*."
Apocynum sibiricum Ait.
Seen only at North Fort Vermilion.

POLEMONIACEAE

Collomia linearis Nutt.
GILIA. In 15 lists throughout the region. Usually in dry places but occasionally where it would qualify as a weed. A native annual.

BORAGINACEAE

Lappula Redowskii (Hornem.) Green var. **occidentalis** (Wats.) Rydb.
BLUE BUR STICKSEED. In 7 lists. Near Fort Vermilion *2823*; Carcajou *2800*. A nuisance weed around settlements.
Mertensia paniculata (Ait.) Don.
LUNGWORT. Keg River district.

LABIATAE

Scutellaria galericulata L.
SKULLCAP. Keg River *2908*. In wet meadows.
Dracocephalum parviflorum Nutt.
DRAGONHEAD. In 5 lists. In dry soil in clearings. In one instance in the Grande

Prairie district it was the prime invader after a burn of several acres extent.

Dracocephalum thymiflorum L.
THYME-FLOWERED DRAGONHEAD. In 5 lists, all around Fort Vermilion except once at Carcajou *2793;* Fort Vermilion *2810.* There are earlier records of this species from several counties in Ontario and from the prairies at Fort Saskatchewan, Alta., and Lebret, Sask. The surprising collections cited above extend the known occurrence of the species, in Canada, far northward. It is a perennial, adventive from Europe. Indications are that it has been scattered with some shipment of goods into the North and might still be tracked down and destroyed.

Stachys palustris L. ssp. **pilosa** (Nutt.) Epling.
HEDGE NETTLE. In 9 lists. Ward's Landing *2897.* Along shores.

Monarda mollis L. var. **menthaefolia** Fern.
WILD BERGAMOT. HORSE MINT. Seen at Carcajou, on dry land of clearing.

Mentha canadensis L. var. **glabrata** (Benth.) Fern.
CANADA MINT. In 5 lists. Least noticed in Fort Vermilion district but by Raup considered common in Wood Buffalo Park.

Lycopus uniflorus Michx.
BUGLEWEED. Believed seen near Keg River Crossing. "Known. . . only on the S. side of L. Athabaska. . ." (Raup. H.M. Jour. Arnold Arb. *17:* 293. 1936).

SOLANACEAE

Solanum nigrum L.
BLACK NIGHTSHADE. Some growing at Fort Vermilion Experimental Sub-station. In places becomes a weed.

SCROPHULARIACEAE

Pentstemon sp.
BEARD-TONGUE. Seen only at Notikewin. Dry roadside.

Castilleja Raupii Pennell.
Keg River Crossing *2933,* on high banks overlooking the Keg River valley towards the Slave Lake — Grimshaw road. The distinctive colour immediately attracted notice. Pennell (5) also cites: White Mud Creek, north of Peace R., *J. M. Macoun (G.S. Can. 61256)* (Can); north of Grimshaw, Peace R. region, *Moss 2242a* (Ph.); Notikewin, Peace R. region, *Moss 2242b* (Ph.); and at numerous points in the Athabaska-Slave Lake region.

Orthocarpus luteus Nutt.
OWL'S CLOVER. In 6 lists. Fort Vermilion *2883.* Dry prairies

Rhinanthus Kyrollae Chab.
RATTLEBOX. In 8 lists. Fort Vermilion *2846;* Keg River Crossing *2849.* Along woodland trails. Found throughout, although in the regions of Raup's lists not indicated as common.

PLANTAGINACEAE

Plantago eriopoda Torr.
SALINE PLANTAIN. Around salt slough, North Fort Vermilion. "White Mud R., *J. M. Macoun 61265.*"

Plantago major L.
COMMON PLANTAIN. In 18 lists. Ward's Landing *2898.* Raup's lists refer only to the variety, except in his "Additions" (8), *Catalogue of the Vascular Plants of the Peace and Upper Liard River Regions,* where he refers specimens from Hudson Hope and Beaverlodge to the species, with the comment "Many or all of Groh's records for *P. major* var. *asiatica* are probably referable to the typical species." In the present survey the weed was found in yards, waste places and on shores; in earlier surveys, chiefly of the agricultural parts of the Peace River district, it was observed to be abundant and widespread as a weed.

RUBIACEAE

Galium boreale L.
NORTHERN BEDSTRAW. In 20 lists. "Dry bluffs along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, *No. 4360.*" Common in dry open situations, as elsewhere in most of Canada. Native perennial.

Galium trifidum L.
SMALL BEDSTRAW. Notikewin *2969.* In poplar woods.

Galium triflorum Michx.
SWEET-SCENTED BEDSTRAW. Keg River *2875,* also at Notikewin. Probably not common.

CAPRIFOLIACEAE

Viburnum pauciflorum Raf.
HIGH-BUSH CRANBERRY. Keg River *2861.* "Poplar woods on bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4378.*" No doubt everywhere in open woodlands.

Symphoricarpos albus (L.) Blake var. **pauciflorus** (Robbins) Blake.
SNOWBERRY. Keg River *2911.* "Dry bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, *No. 4387.*"

Symphoricarpos occidentalis Hook.
WOLFBERRY. "Dry bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug.

15, No. *4388.*" The two species recorded in 20 of 23 lists, but without much attention to their separation. Both grow in dry semi-open woods and on prairies. They seldom persist under cultivation.

Lonicera glaucescens Rydb.
HONEYSUCKLE. Keg River *2922.* In dry poplar woods.

CAMPANULACEAE

Campanula rotundifolia L.
BLUEBELL. In 9 lists, mostly in dry locations.

COMPOSITAE

Grindelia perennis A. Nels.
GUMWEED. North Fort Vermilion, near Revillon store *2886,* and nowhere else north of Peace River. However, Raup reports it "Common on the Salt Plain prairies." (7) A specimen collected by J. M. Macoun at Dunvegan as *G. squarrosa* (Pursh) Dunal is also this.

Solidago decumbens Greene var. **oreophila** (Rydb.) Fern.
Keg River *2929, 2951.*

Solidago lepida DC.
Keg River *2862.*

Solidago lepida DC. var. **elongata** (Nutt.) Fern.
Keg River *2928.* "Bank of Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4350.*"

Aster brachyactis S.F. Blake (*angustus* (Lindl.) T. & G.)
RAYLESS ASTER. In 4 lists. La Crate *2801;* Ward's Landing *2899.*

Aster conspicuosus Lindl.
"Poplar woods on bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4372.*"

Aster Lindleyanus T. & G.
In 7 lists. Keg River *2931.* "Bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4371.*"

Aster ericoides L.
WHITE HEATH ASTER. Notikewin *2964;* also at Keg River. "Dry bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4370.*" Dry prairies.

Aster junceus Ait.
RUSH ASTER. "Bank of Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4351.*"

Erigeron canadensis L.
CANADA FLEABANE. HORSEWEED. In 5 lists. Fort Vermilion *2888.* A native annual, often a weed in crop or fallow.

Erigeron philadelphicus L.
PHILADELPHIA FLEABANE. Lambert Point, east of Fort Vermilion *2820.* Also at Keg River. A native perennial of clump habit, throughout the Peace River district but not abundant, as it sometimes becomes in the East.

Antennaria nitida Greene.
EVERLASTING. North Fort Vermilion *2840.* "White Mud R., *J. M. Macoun No. 61224.*" Forming patches on dry prairie and in open woods.

Helianthus spp.
WILD SUNFLOWER. Seen once or twice but not collected.

Bidens cernua L.
BEGGAR'S TICKS. Notikewin *2960.* In wet situation.

Achillea Millefolium L.
COMMON YARROW. "Dry bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4364.*" "Notikewin, *Moss No. 2268.*" Including some plants from drier places which approach the description of *A. lanulosa* Nutt., this native weed appears (the only one to do so) in every survey list. As elsewhere in Canada, this incidence over-emphasizes its weed status. It is shallow rooting and yields readily to tillage. Perennial.

Achillea sibirica Ledeb.
In 8 lists. Keg River *2872.* Of northern range but widespread in the Peace River district.

Matricaria matricarioides (Less.) Porter.
PINEAPPLEWEED. In 8 lists. Fort Vermilion *2882.* A far western species which has spread through to the Atlantic coast. Chiefly in yards.

Artemisia biennis Willd.
BIENNIAL WORMWOOD. In all lists but one. Ward's Landing *2900;* Keg River *2952.* A native wormwood of clearings but also in crops to some extent.

Artemisia frigida Willd.
PASTURE WORMWOOD. In 5 lists. Less frequent than farther south where excessive occurrence is taken as an indication of overgrazing. "Dry bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4383.*"

Artemisia gnaphalodes Nutt.
Notikewin *2966,* and southward only. A dry land plant.

Artemisia Tilesii Ledeb.
"Dry bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4359.*"

Petasites palmatus (Ait.) Gray.
SWEET COLTSFOOT. Keg River *2936.*
Petasites vitifolius Green.
Keg River *2937.*
Petasites sagittatus (Pursh) Gray.
Keg River *2938;* Notikewin *2971.*
Arnica Chamissonis Less. ssp. **foliosa** (Nutt.) Maguire.
ARNICA. Keg River Crossing *2935;* Keg River *2914;* seen only three times in this part.
Senecio eremophilus Richards.
RAGWORT. In 6 lists. Fort Vermilion *2813.* Perhaps less frequent than in Grande Prairie, or in Peace River Block especially.
Senecio pauperculus Michx. var. **Balsamitae** (Muhl.) Fern.
Keg River *2913.*
Cirsium undulatum (Nutt.) Spreng.
WAVY-LEAVED THISTLE. In 6 lists. Fort Vermilion district *2819.*
Centaurea Cyanus L.
BLUEBOTTLE. Seen at North Star, south of Notikewin. A waif, perhaps not becoming established.
Crepis tectorum L.
NARROW-LEAVED HAWKSBEARD. An extensive infestation in a field east of Fort Vermilion *2821.* This is one of the newer invaders from Europe. In northern Alberta and British Columbia it is now found widespread. It is recorded from all the other provinces. Annual.
Hieracium canadense Michx.
CANADA HAWKWEED. In 14 lists. A native hawkweed across Canada in pastures, prairies and open woods.
Taraxacum officinale Weber.
COMMON DANDELION. In 13 lists. Keg River *2916.*
Sonchus arvensis L. var. **glabrescens** Gunth., Grab. & Wimm.
SMOOTH PERENNIAL SOW THISTLE. Keg River *2921,* several square rods infested in a temporarily abandoned field. The patch had been destroyed by a neighbour concerned to prevent seeding, but without quite reaching the limits of the colony. Sow thistle undoubtedly will thrive here if allowed to spread, with consequences all too well known in the grain fields farther south.
Sonchus asper (L.) Hill.
SPINY ANNUAL SOW THISTLE. North Fort Vermilion *2887,* and at Experimental Sub-station. Introduced.
Lactuca pulchella (Pursh) DC.
BLUE LETTUCE. In 15 lists. Notikewin *2968.* "Dry bluff along Peace R. about 10 mi. above Carcajou Settlement, Aug. 15, No. *4363.*" One of the more persistent native weed species, requiring extra and deep tillage for its control.

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EXHIBITION OF NATURE PHOTOGRAPHY

The Second Country Life International Exhibition of Nature Photography will be held at the Central Hall, Westminster, London, England, from March 17 to April 3, 1950. The Exhibition will be confined to birds, mammals, insects and fish, photographed alive and in their wild state. Either black and white prints or colour transparencies may be entered. Six silver and six bronze plaques as well as Certificates of Merit will be awarded for exceptional work. The last date for receiving entries is November 30, 1949. Further information may be secured from the Organizing Secretary, Miss Phyllis Barclay-Smith, c/o Country Life, 2-10 Tavistock Street, Covent Garden, London, WC2, England, or from the Editor, Canadian Field-Naturalist.

FOSSIL ELEPHANTS OF MANITOBA[1]

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REMAINS of fossil elephants have been found in many parts of western Canada, particularly in Alberta. Mastodon has been reported from Manitoba but to date no record of mammoth is known to the writer. Within the past few years fragments of tusks and teeth of mammoth from four localities in Manitoba have been sent into the Manitoba Museum and the Geology Department at The University of Manitoba. The specimens have been deposited in the collections of the Manitoba Museum and the writer wishes to express his thanks to that organization for permission to describe and illustrate the specimens. The writer also wishes to express his thanks to Mr. C. M. Sternberg of the Geological Survey of Canada for data on fossil elephants in Canada and opinions on the identity of the Manitoba specimens.

The first recorded discovery of fossil elephant in Manitoba is that of a pair of mutilated scapulae. These were sent to Sir John Richardson in England who in his "Zoology of the Voyage of H.M.S. Herald" (1854) on page 101 first described the bones as belonging to a new species of *Elephas* which he named *Elephas rupertianus*, but later, on page 140, revised his determination and placed the bones as probably belonging to *Mastodon giganteus*. Hay (1924, p. 121) used the name *Mammut americanus* instead of *Mastodon giganteus* for the bones described by Richardson. He believed that, although it appeared impossible to determine their identity as *M. americanum*, they probably belonged to an elephant. In Osborn's (1936, p. 137) recent memoir on the Proboscidea the specific reference for *E. rupertianus* is given as *Mastodon americanus rupertianus*. Unfortunately there is neither a description nor a discussion to accompany this specific designation.

There seems to be some doubt as to the locality where the bones for the above species were collected. Richardson (1854, p. 101) in his description gave the locality as the banks of the Swan River, near the western side of Lake Winnipeg basin, and this is also the locality given by Osborn (1936, p. 137). On a map by Hay (1924, p. 341) the locality is given as the region of Pelly, Saskatchewan, but Hay (1924, p. 121) noted that Tyrrell reported the locality to be along the banks of the Shell River in Manitoba. Apparently Sternberg (1930, p. 62) followed Hay in placing the locality for this find as Pelly, Saskatchewan. In the published reports of the Geological Survey of Canada both Spencer and Tyrrell described the Shell River in Manitoba as the locality for the discovery of fossil elephant bones. Spencer (1876, p. 63) in his report on the Shell River valley recorded that the bones, which he believed probably belonged to *Elephas primigenius*, were described to him by a man who had also seen the locality where the bones were found. Spencer mentioned, however, that the specimens were sent to Fort Ellice before they were sent to England, and it may be that the bones referred to by Spencer are not the same as those sent to Fort Pelly, or that his informant was in error.

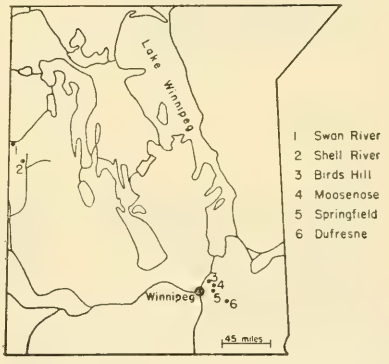

Fig. 1. Map of Southern Manitoba.

According to Tyrrell (1892, p. 129E) the bones were collected on the banks of the Shell River, and were taken to W. J. Christie, officer in charge of Fort Pelly, who later visited the locality. Since Christie informed Tyrrell of this in a personal communication it seems quite apparent that the references to Pelly or Swan River as the locality for the bones are in error, and the locality should read Shell River.

According to Christie the bones were found in the water at the base of a landslide. Tyrrell described the locality as a low terrace on the west side of the Shell River between

[1] Received for publication June 19, 1948.

latitude 51° 43′ and the mouth of the east branch. A study of the Duck Mountain Sectional Sheet 171 of the Topographical Survey of Canada shows that this locality is in the Duck Mountain Forest Reserve No. 1 and is probably in either Section 30 or 31 of Township 31, Range 27, west of the Principal Meridian or the two adjacent sections in the next range west.

If the bones from the Shell River locality belong to mastodon they are of considerable interest for they represent the only known published record of mastodon from the Canadian prairies[2] and as shown on the maps by Osborn (1936 fig. 680; 1942, plate XIX) mark the migration path of the mastodonts from Alaska-Yukon to eastern Canada and the United States.

Through the courtesy of Miss K. M. Haig of the Winnipeg Free Press I have a letter addressed to her from Dr. W. J. Gunne of Kenora, Ontario, in which he writes that a mastodon tooth had been found in the gravel pit near Moosenose and is now in a museum in London, England. The pit near Moosenose is in Sections 29 and 30, Township 11, Range 5, east of the Principal Meridian. Dr. Gunne kindly forwarded a letter to me from Mr. E. D. McLeod of Winnipeg who writes that he found the tooth in the "earth composed of very gummy nature" at the south end of the pit. The writer has no knowledge of any published report on this tooth.

The mammoth remains consisting of two teeth and two fragments of tusks have been found at four localities in gravel deposits of Pleistocene age. The gravels are moderately well rounded and undoubtedly the fossils have been washed in with the gravels from elsewhere and probably some distance from where they were discovered. The specimens when received by either the late Mr. Harry Rand, Keeper at the Museum, or the writer were in very poor condition being thoroughly water soaked. The specimens cracked on drying and seperated into layers—this being particularly noticeable with the tusks—so that they required treatment with an alvar-acetone mixture to prevent crumbling and eventual destruction.

A fragment of a tusk approximately 38 cm. (15.4 inches) long with a diameter of 12.3 cm. (4.8 inches) at its thickest end, illustrated as figure 3 on plate 1 was found by Mr. A. McKenzie and sent in for examination by Dr. D. Baldwin of Benito. Through their kindness we have been permitted to place the specimen in our collections. The writer is greatly indebted also to Dr. Baldwin for his letter giving the data on the locality and the type of deposit where the specimen was found. Dr. Baldwin writes as follows:

> "This specimen was found by Mr. Alex McKenzie while getting gravel out of the gravel pit about 3½ miles north of Benito on the south bank of the Swan River. The banks of the river are here 100 feet high and consist of rather fine sandy gravel, no stone except very small. It is in layers for the most part as though having been formed under water and is a dark reddish brown color containing an abundance of iron oxide. The specimen was found about 20 feet from the surface of the pit and about 200 feet up from the river and about 50 feet above water level in the river. This gravel bed goes down to a great depth I believe, anyway the bottom of it has not been reached. The specimen was right in a layer of this gravel or fine sandy gravel or gravelly sand."

This fragment of tusk was found about 25 miles north of the locality where the mastodon scapulae were reported to have been discovered and thus marks the second record of fossil elephant for the Shell River-Swan River district.

The second fragment of tusk in the collection was given to the Museum by Messrs. R. Johnson and S. Prettie. They found the specimen 30 feet below the surface in a gravel pit which they described as being 4 miles east and 1 mile north of Transcona. A gravel pit mapped near Springfield, about 4 miles east of Transcona, on the Winnipeg Sectional Sheet 62H in Section 12, Township 11, Range 4, east of the Principal Meridian is probably the locality where they found the specimen. The tusk which has a slight curvature is 50 cm. (19.7 inches) long with a diameter of 7.6 cm. (3 inches) at its thickest end. This specimen is illustrated as figure 4 on plate 1.

A small mammoth tooth, probably a milk tooth, illustrated as figures 1 and 2 on plate 1 was found in the kame or esker deposit at Birds Hill. The collector and exact locality where this specimen was found are not known. Unfortunately a large part of the crown and anterior of the tooth has been destroyed so that only a very small part of the grinding surface is still intact. The tooth has a height of 9 cm. and a breadth of 4.9 cm.

[2] Sternberg in a personal communication writes that he knows of no record of mastodon from this area.

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Plate 1. Figs. 1-2. MAMMONTEUS PRIMIGENIUS? Two views of a milk tooth from Birds Hill, X½. Manitoba Museum L101P. Fig. 3. Fragment of a mammoth tusk from Swan River, north of Benito, X 1-5. Manitoba Museum L221P. Fig. 4. Fragment of a mammoth tusk from Springfield, X 1-5. Manitoba Museum 102P. Figs. 5-6. MAMMONTEUS PRIMIGENIUS. View of grinding surface and side of tooth, east of Dufresne, X½. Manitoba Museum L222P.

The fourth specimen in the collection is a large mammoth molar tooth which was found by Mr. Harry Norman of Dufresne and placed in the Manitoba Museum through the kindness of Mr. Lisle Norman. The specimen was found about 5 miles east of Dufresne in a gravel-pit located in the south-east quarter of Section 21, Township 9, Range 7, east of the Principal Meridian. After the discovery of the tooth Mr. Rand, in the company of the Normans, visited the pit and he informed the writer that the specimen was buried beneath five feet of gravel and sand. This tooth which has the anterior part missing is illustrated as figures 5 and 6 on plate 1. Due to natural wear the tooth has been abraded obliquely so that the crown at the posterior part is about twice as high as at the anterior part. The grinding surface is 8.2 cm. wide and about 12 cm. of its length is preserved. At the posterior end the height of the tooth is 12.2 cm.

The tusks have been referred to as mammoth but since they are very short, poorly preserved fragments a positive identification can not be made. It is possible that either or both specimens might belong to mastodon rather than to mammoth. Judging from the number of records of mammoth remains from the Canadian Prairie Provinces as compared with the one doubtful occurrence of mastodon at Shell River it seems more probable that the fragments of tusk under discussion belong to mammoth.

The molar tooth described above has been identified as *Mammonteus primigenius* and the milk tooth probably belongs to the same species. In some respects the molar tooth resembles the molars of *Parelephas jefferi-soni*, a closely related type, but there appears to be more compression of the ridge plates in our specimen than in that species.

Very few fossils have been found in the Pleistocene deposits of Manitoba. A few invertebrates and plants were found by Tyrrell (1892, p. 217E) in the clay exposures on the Rolling River, and a few bones have been found in the Lake Agassiz clays at Winnipeg. To this very meager record of Pleistocene life for Manitoba we may now add mammoth and mastodon.

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ADDITIONAL NOTES ON THE BIRDS OF BLUE SEA LAKE, QUEBEC[1]

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IN 1938 I published a paper entitled "Summer Notes from Blue Sea Lake, Quebec" (Can. Field-Nat., Vol. 52, No. 6, pp. 79-87). This represented notes accumulated during the summer of 1937. Since that date, I have spent additional time at this lake and have accumulated notes on additional species as well as those listed in the first paper. In the ensuing years the following periods have been spent at Blue Sea Lake: July 31 to August 21, 1938; August 5 to September 1, 1939; August 27 to September 1, and September 5 to 7, 1940; June 25 to July 27, 1941; July 9

1 Received for publication August 10, 1948.

to July 22, 1942; September 30 to October 21, 1944; September 9 to September 18, 1945; July 14 to August 25, 1947.

In addition to my own notes, Mrs. P. A. Taverner has very graciously allowed me to examine the log which Mr. Taverner kept for many years at Blue Sea Lake. Taverner's log which began in August, 1919, has entries on the following dates: August 3, 10, 11, 12, 14, and 24, 1919; April 24 and 25, May 8 to 11, October 13 to 17, 1920; April 23, 24, 25, October 2, 5, and 7, 1921; May 23, 26, June 2, 3, 4, 23, 24, 25, August 11, 25, 28, September 10, 11, 28, 30, and October 22, 1923; and June 29, 1931.

This log book also contained records written by Hoyes Lloyd on the following dates: June 30, July 1, 2, 1923; June 2 to 6, and June 12 to 14, 1926; October 26 to November 1, 1926; and May 14 to 16, 1927. Mr. Lloyd has written that he made the entries himself in the book and that Mr. Taverner was not with him on these dates. Big Island was also visited on the A.O.U. trip for the Ottawa meeting on October 16, 1926, and the records of that day are also included in the list.

After 1931, only sporadic notes were kept. That is, when some record excited Taverner's interest, a note was entered. Record was not kept of all the species seen on any date after June 29, 1931.

In going over my notes for the periods indicated and the records kept by Taverner and Hoyes Lloyd, I have endeavored to eliminate anything that was not of interest in addition to the notes published in 1937. Taverner's notes were particularly valuable because they covered a much greater seasonal span than my own visits. Therefore, they have added many species and much additional interesting information for the area.

Colymbus grisegena holböllii (Reinhardt).

Holboell's Grebe. Two of these birds were on Blue Sea Lake from October 13 to October 17, 1944. They were still rather noisy — much more so than when in winter quarters farther south. Taverner records one on September 30, one on October 22, 1923, and one on October 17, 1926.

Colymbus auritus Linnaeus.

Horned Grebe. Hoyes Lloyd noted one on October 26, and two each on October 27 and 28, 1926.

Podilymbus podiceps podiceps (Linnaeus).

Pied-billed Grebe. In 1941, a pair bred on the little pond north of Messines. The two young were seen on June 26 and again in July. Three birds were present on July 15 and four on July 21, presumably the same family.

Ixobrychus exilis exilis (Gmelin).

Eastern Least Bittern. Taverner saw a single bird on June 29, 1931.

Branta canadensis subsp. ? ( ).

Canada Goose. A flock of 63 Canada geese flew over my wife and I while we were walking along the lake shore on October 16, 1944. Taverner's notes contained references to geese on April 24, and October 2 and 5, 1921.

Anas rubripes Brewster.

Black Duck. This species has certainly become more regular as a summer resident in recent years. Taverner's only note mentions two seen on May 25, 1923. Hoyes Lloyd saw ten on October 28, 1926. I saw it with fair regularity in July, 1941, July, 1942, and July, 1947. It was slightly more numerous in 1947. I also saw a single bird on October 16, 1944.

Anas discors Linnaeus.

Blue-winged Teal. Three birds were seen on August 4, 1938.

Aix sponsa (Linnaeus).

Wood Duck. Four individuals were seen on Little Cedar Lake on August 22, 1947, and four, possibly the same individuals, at Sheep Island on Blue Sea Lake on August 23.

Aythya collaris (Donovan).

Ring-necked Duck. A female with eight downy young was discovered on July 6, 1941, on the same little pond near Messines on which the pied-billed grebes lived. They were seen again on July 15. Taverner listed these birds on September 30, 1923.

Aythya affinis (Eyton).

Lesser Scaup Duck. A single bird on Blue Sea Lake on October 5, 1944.

Charitonetta albeola (Linnaeus).

Bufflehead. A single bird was on the lake most of the day on October 16, 1944.

Melanitta perspicillata (Linnaeus).

Surf Scoter. One listed October 17, 1926, in Taverner's notes.

Lophodytes cucullatus (Linnaeus).

Hooded Merganser. Taverner noted this bird on October 16 and 17, 1920; August 28 and September 12, 1924; and October 16, 1926. I saw two on July 1, 1941, noted one to four birds near the cabin nearly every day from October 1 to October 20, 1944, observed it again on September 12 and 18,

1945 (ten birds being present on the latter date), and saw it fairly regularly in July and August, 1947. This is another species which has increased somewhat during the past decade.

Mergus serrator Linnaeus.

Red-breasted Merganser. Taverner's log noted this species only once though he listed the American merganser regularly. Hoyes Lloyd saw two on October 31, 1926. My own experience has been similar.

Buteo jamaicensis borealis (Gmelin).

Eastern Red-tailed Hawk. An adult red-tailed hawk almost certainly the eastern form was seen at Blue Sea Lake on October 12, 1944.

Buteo lineatus lineatus (Gmelin).

Northern Red-shouldered Hawk. Red-shouldered hawks, almost certainly of this form ,were seen on July 4, 12, and 14, 1941, and July 26, 1947. None were collected.

Buteo platypterus platypterus (Vieillot).

Broad-winged Hawk. This bird bred on Big Island in 1947, since I found four barely fledged young, one of which was collected on July 30, 1947, in the centre of the island. The family was noted on several subsequent dates during the summer.

Buteo lagopus s. johannis (Gmelin).

American Rough-legged Hawk. Two individuals were seen on October 12, 1944, and one on October 16, 1944. Hoyes Lloyd saw one on October 29, 1926.

Haliaetus leucocephalus subsp ?

Bald Eagle. Only one bald eagle was reported in the previous paper but since then it has been observed on July 5, 1941, and July 20, 1942. Taverner's only record is one seen on the A.O.U. field trip on October 16, 1926.

Pandion haliaetus carolinensis (Gmelin)

Osprey. In 1937, a single bird of this species was reported on four dates. In subsequent years, I have seen it frequently in July, but only a single bird on each occasion. Taverner's notes reveal the same status except that he recorded four on June 2, and three on June 4, 1920.

Falco sparverius sparverius Linnaeus.

Eastern Sparrow Hawk. During the years, I have added only a single record on August 11, 1947, to the two individuals reported previously. Taverner's notes show one bird on August 3, 1919, two on April 24, 1920, and one on September 10, 1923.

Capella gallinago delicata (Ord).

Wilson's Snipe. A single bird was seen on October 12, 1944.

Actitis macularia (Linnaeus).

Spotted Sandpiper. Usually these birds are gone by September 1, but Taverner recorded one bird on September 10, 1923, and I saw one on October 1, 1944, and four on September 15, 1945.

Lobipes lobatus (Linnaeus).

Northern Phalarope. Taverner's log contains a notation of two seen in August, 1942.

Larus philadelphia (Ord).

Bonaparte's Gull. A single individual came to the lake on August 13, 1947, on the 17th one stayed all day on the lake spending most of the time resting on the water almost directly in front of my cabin. While this was my first record Taverner noted four on August 10, 1919, and others from August 25-28, 1923. He also recorded the fact that R. M. Anderson had seen them on May 23, 1923.

Strix varia varia Barton.

Northern Barred Owl. Listed by Taverner as seen by R. M. Anderson in October, 1922.

Chordeiles minor minor (Forster).

Eastern Nighthawk. The nighthawk has been recorded twice since 1937 — two birds were seen on July 21, 1941 and a single one on July 20, 1942. Taverner's notes mention it occasionally. He reported four birds on August 3 and three on August 11, 1919 and two on August 11, 1923. Hoyes Lloyd saw one on July 1, 1923 and one each on June 4 and 5, 1926.

Hylatomus pileatus abieticola (Bangs).

Northern Pileated Woodpecker. Taverner saw one bird each on October 14 ,15, and 17, 1920, June 3 and 24, 1923. While the workings of this bird were obvious in all parts of Big Island and my wife saw the birds frequently during periods when I was not at the lake, I did not actually see one until September 15, 1945. Single birds were also seen on September 17 and 18, 1945, and three birds on August 20, 1947, all on Big Island.

Dendrocopos villosus villosus (Linnaeus).

Eastern Hairy Woodpecker. While I recorded only one hairy woodpecker in the previous paper, Taverner had numerous records in April, May, August, September and October. I found it regularly in July, 1941, October, 1944, and September, 1945, although usually only one or two birds on a single date. A specimen collected on July 4, 1941,

seems to be of this race while one taken on October 10, 1944 is intermediate between *villosus* and *septentrionalis*.

Picoides arcticus (Swainson).

Arctic Three-toed Woodpecker. Taverner recorded this species first on September 28, 1923, and notes that R. M. Anderson saw one on October 22 of the same year. One was also observed on October 17, 1926. I collected one on Big Island on October 11, 1944, and saw another one back of my cabin on September 11, 1945.

Empidonax flaviventris (Baird & Baird).

Yellow-bellied Flycatcher. I collected a female at the north end of Blue Sea Lake on July 21, 1941. There were several other birds present which were probably this species but none were collected.

Nuttallornis borealis (Swainson).

Olive-sided Flycatcher. Taverner has a record of one on June 4 and another on August 11, 1923. I have never seen the bird in this district since the one observed at Maniwaki in 1937.

Eremophila alpestris subsp.

Horned Lark. Taverner noted ten horned larks on October 14, 1920, which is the only record for the area.

Iridoprocne bicolor (Vieillot).

Tree Swallow. These birds are not usually found around the lake until late in July. However, Hoyes Lloyd recorded one on June 13, 1926, and another one on July 1, 1923. I saw two on the lake on June 26, 1941 — all other records being in late July and August.

Riparia riparia riparia (Linnaeus).

Bank Swallow. Bank Swallows were only seen once in 1937, but were common in 1941 — 8 being seen at Messines on July 28; ten at Cedar Lake, July 5; three at Cameron Bay on July 11; fifty plus in two colonies on the river at Maniwaki, on July 15; ten at Cameron Bay on July 17; and four at Cedar Lake on July 21. I have not seen a bank swallow in the territory since, although I have visited these localities except those near Maniwaki frequently.

Hirundo rustica erythrogaster Boddaert.

Barn Swallow. This species must have radically changed its status since Taverner kept daily records. He recorded it only as follows: ten, August 3; two, August 12; and fifty, August 13, 1919; and six, June 29, 1931. Since 1937, I have found it to be a common and conspicuous summer resident whenever I was at the lake in June, July, or August.

Progne subis subis (Linnaeus).

Purple Martin. Taverner saw two on June 30, 1923, and the same number on June 29, 1931.

Perisoreus canadensis canadensis (Linnaeus).

Canada Jay. Taverner records that R. M. Anderson saw one in October, 1922, and that he saw one on May 16, 1924.

Corvus corax principalis Ridgway.

Northern Raven. A single raven was present most of the day on August 4, 1938.

Sitta carolinensis cookei Oberholser.

White-breasted Nuthatch. Taverner noted three of these birds on May 8 to 11, 1920; one on April 24, 1921. Hoyes Lloyd noted two on June 4; one on June 6, and one on October 30, 1926; and one May 15, 1947. I have not noted it at all.

Certhia familiaris americana Bonaparte.

Brown Creeper. I failed to find a brown creeper in 1937, but Taverner's notes record one on April 25 and May 8-12, 1920, October 2 and 5, 1921. Hoyes Lloyd noted it on October 29, 1926. In 1941, a pair spent the summer close to the cabin and I saw them practically every day. There were also a few both on the island and mainland in October, 1944, and a single bird on July 26, 1947.

Troglodytes aedon aedon Vieillot.

Eastern House Wren. This species must have become more abundant in recent years. Taverner's notes only refer to it once when he noted a single bird on August 13, 1919. During my visits it has been a fairly common bird around the lake. It was most regularly seen in 1937 and 1941, but was absent in July and August, 1947, when I failed to record a single bird.

Dumatella carolinensis (Linnaeus).

Catbird. The catbird has been recorded very infrequently. I saw four at the south end of Blue Sea Lake on July 4, 1941, and two at Messines, September 18, 1945.

Toxostoma rufum rufum (Linnaeus).

Brown Trasher. Two birds were noted at the south end of the lake on August 4, 1938, and are the only additional record for the area.

Hylocichla guttata faxoni Bangs and Penard.

Eastern Hermit Thrush. Taverner recorded hermit thrushes only twice, once on September 30, 1923, and again on September 27, 1926. In addition to the pair that bred in 1937, a pair remained on Big Island in the

summer of 1941, and one or two individuals were also seen at intervals through the same season at Blue Sea Lodge. They were found frequently in October, 1944, and again in September, 1945.

Hylocichla minima subsp.

Gray-cheeked Thrush. Taverner's notes record one on August 11, 1919.

Hylocichla fuscescens fuscescens (Stephens).

Veery. Taverner noted three on August 3, 1919, and listed it as common from May 23-June 25, 1923. Hoyes Loyd saw one to four birds each date on which records were kept in June, 1926, except on the 3rd and 12th. He also saw one on May 14, 1927. I saw one on July 4, 1941, my only additional record of this species.

Regulus satrapa satrapa Lichtenstein.

Eastern Golden-crowned Kinglet. Hoyes Lloyd saw four golden-crowns on October 30 and one on November 1, 1926. I did not record this species until July 25 ,1941, when a group of seven came to the cabin. It was apparently five newly-fledged young and their parents. One of the juveniles was collected. In all probability they nested on the island since the youngsters were still somewhat uncertain of their flying powers. On July 30, 1947, another group, probably a family, was seen on the island. Golden-crowns were seen nearly every day in October, 1944, and on September 12 and 15, 1945.

Regulus calendula calendula (Linnaeus).

Eastern Ruby-crowned Kinglet. The ruby-crown has not been noticed in mid-summer. Taverner saw one each day on June 4 and 6, one September 28, 1923,and one October 16, 1926. Hoyes Lloyd noted one on October 26, 1926, and four on May 16, 1927. My only records are of a single bird seen on Big Island on October 1, and a number in a mixed flock of 25 kinglets on October 10 on Big Island. I collected a single bird on the north shore of the lake on October 17, 1944.

Anthus spinoletta rubescens (Tunstall).

American Pipit. Taverner records four on September 28, 1923, and six on the A.O.U. trip on October 16, 1926. I saw six on October 12, 1944, at Cameron Bay and nine on October 16, 1944, on the north shore of the lake.

Bombycilla cedrorum Vieillot.

Cedar Waxwing. This species has obviously become more abundant in late years. Taverner only listed it once when he saw six birds on August 3, 1919. It was noted regularly in 1937, and was equally abundant in 1941 and 1947.

Lanius excubitor borealis Vieillot.

Northern Shrike. Hoyes Lloyd saw two on October 29, 1926.

Sturnus vulgaris vulgaris Linnaeus.

Starling. Taverner had no records of this species, but it has been common around the lake since I began visiting the country.

Vermivora peregrina (Wilson).

Tennessee Warbler. Taverner saw two on August 10, 1919, and three on September 11, 1923. Hoyes Lloyd noted one on June 4, 1926. In late years I have not found this species in the area although I have looked carefully for it.

Vermivora ruficapilla ruficapilla (Wilson).

Nashville Warbler. Taverner only recorded this species once when he saw a single bird on September 11, 1923. I found it rare in 1937, but did find two nesting pairs. However, in 1941, it was fairly common and rather widely distributed on the west side of Blue Sea Lake where three juveniles were collected on July 11.

Parula americana pusilla (Wilson).

Northern Parula Warbler. Taverner recorded one bird on September 11, 1923, and Hoyes Lloyd listed single birds on June 4 and 6, 1926, and May 16, 1927. There has been a nest regularly in a little cove near my cabin. It is close enough so that the bird's song can be heard regularly through the open windows.

Dendroica petechia aestiva (Gmelin).

Eastern Yellow Warbler. The yellow warbler has never been seen regularly around the lake. In fact, it has been one of the rarer warblers. Taverner recorded six on August 3, and three on August 13, 1919, and two on June 29, 1931. My only record since 1937 is that of seven birds seen along the Gatineau River south of Maniwaki on July 15, 1941.

Dendroica tigrina (Gmelin).

Cape May Warbler. Taverner records one bird on September 11, 1923, and a second on June 29, 1931. My only record is of an individual beside the cabin on August 31, 1940.

Dendroica caerulescens caerulescens (Gmelin).

Black-throated Blue Warbler. Taverner's log recorded this species only in June 1926, at which time Hoyes Lloyd reported it on a number of dates. In 1937, it was very common all about the lake but has been far

less abundant in any succeeding year. One or two pair have frequented Big Island each summer, but I have not found it to be common on the mainland since 1937.

Dendroica coronata coronata (Linnaeus).

Myrtle Warbler. A pair of these birds have nested near my cabin each year, bringing their young to the trees along the lake as soon as they are fledged. Taverner's notes show it to be a common spring and fall migrant and it was one of the most numerous species in October, 1944, and September, 1945, the only years I have been on the lake in the fall.

Dendroica castanea (Wilson).

Bay-breasted Warbler. Taverner recorded this bird on three August days in 1919, and in May, June, and August 1923. Hoyes Lloyd noted it on June 3 and 4, 1926. Since 1937, I have seen it only on August 31, 1940, and on July 16 and August 21, 1947.

Dendroica striata (Forster).

Black-poll Warbler. Taverner listed it on August 10 and 11, 1919, and August 25 to 28 and September 11, 1923.

Seiurus noveboracensis noveboracensis (Gmelin).

Northern Water-Thrush. Taverner listed this species on three days in August 1919, and on every date up to August 11, 1923, and on June 29, 1931. Hoyes Lloyd notes show one to four birds on every list in June of 1926, and also record it on May 16, 1947. I did not find the species in 1937, but did not find one pair on Big Island close to the cabin in 1941 where I saw and heard them nearly every day. A pair nested in the same territory in 1942 and again in 1947. On each occasion fledglings appeared along the beach soon after my arrival on the island.

Oporornis philadelphia (Wilson).

Mourning Warbler. This bird was somewhat more conspicuous in 1941 than in 1937, but it has not been recorded since. Taverner listed it only on August 3, 1919, when a single individual was seen.

Wilsonia pusilla pusilla (Wilson).

Wilson's Warbler. A single male stayed about the cabin for an hour or more on September 15, 1945.

Dolichonyx oryzivorous (Linnaeus).

Bobolink. The bobolink was about as common in July of 1941 and 1942 as it had been in 1937, but has not been recorded in my notes since. Taverner saw three on August 3, 1919, the only date on which he mentioned it.

Agelaius phoeniceus phoeniceus (Linnaeus).

Eastern Redwing. This species is more abundant than my 1937 notes indicate. Taverner recorded it on August 12 and 14, 1919; April 23 and 24, October 2, 1921; and May 23, 1923. Hoyes Lloyd noted it on June 6, 1926. I saw a flock of fifty at the north end of the lake on August 4, 1938, and a pair nested at Cameron Bay in 1941 where I saw them repeatedly.

Icterus galbula (Linnaeus).

Baltimore Oriole. Taverner saw one August 14, 1919, and another May 25, 1923. A single bird was present at Blue Sea Lodge on July 16 and 17, 1947.

Euphagus carolinus (Müller).

Rusty Blackbird. I collected a single rusty blackbird on Big Island on October 3, and saw a flock of ten at Cameron Bay October 12, 1944.

Molothrus ater ater (Boddaert).

Eastern Cowbird. Taverner's notes record two cowbirds on August 3, 1919, and Hoyes Lloyd saw one on June 4, 1926.

Passerina cyanea (Linnaeus).

Indigo Bunting. I only saw one indigo bunting in 1937, but found the species common in brushy pastures around the lake in 1941 all through July. I saw up to twenty in one day that season but have only seen buntings on August 4, 1938, and August 11, 1947, since. Taverner did not list it at all.

Hesperiphona vespertina vespertina (Cooper).

Eastern Evening Grosbeak. One was collected from a flock of ten on Big Island on October 9, 1944, and I saw a single female along the road south of Messines on August 25, 1947.

Carpodacus purpureus purpureus (Gmelin).

Eastern Purple Finch. Taverner's records show this bird to be a somewhat regular spring migrant and Hoyes Lloyd noted their presence through most of June, 1926. The only fall record in Taverner's log was on the A.O.U. field trip, October 16, 1926. I found it regularly through October, 1944, and on September 16 and 17, 1945. There were single birds on Sheep Island on July 29, and Big Island on July 30, 1947. I have only one other summer record when six birds were seen on July 15, 1941, along the Gatineau River south of Maniwaki.

Pinicola enucleator leucura (Müller).

Canadian Pine Grosbeak. Taverner saw six on October 22, 1923.

Spinus pinus pinus (Wilson).

Northern Pine Siskin. Taverner saw fifteen birds on both April 23 and 24, 1921, and noted others on October 2, 1921. He listed ten birds on September 30, 1923, and Hoyes Lloyd saw thirty on both October 31 and November 1, 1926. My only record is a flock of ten on October 4, 1944.

Loxia curvirostra subsp. ?

Crossbill. Crossbills were frequently heard flying over both Big Island and Sheep Island in 1947. Three birds fed for some time in a tall spruce on Big Island on August 11, and two birds in the same tree on August 20 of that year.

Junco hyemalis hyemalis (Linnaeus).

Slate-colored Junco. The Junco has been a rather scarce summer resident but according to Taverner's records a common spring and fall migrant. I found it very common in October, 1944.

Spizella arborea arborea (Wilson).

Eastern Tree Sparrow. Taverner listed three birds on April 25, 1920, and I found numbers each day from October 10-16, 1944.

Plectrophenax nivalis nivalis (Linnaeus).

Eastern Snow Bunting. Taverner's log records five birds on April 24, and one on April 25, 1926.

STRIKING ABUNDANCE OF A LEAF BEETLE, CALLIGRAPHA PHILADELPHICA L. [1]

S. D. HICKS
Ottawa, Ont.

LEAF BEETLES of the genus *Calligrapha* have been noted in literature, on a few occasions, as being of some economic significance. There are two outstanding examples of this recorded from the United States. The one at Cambridge, Massachusetts, in 1884 concerns *Calligrapha scalaris* Lec.; Dr. H. A. Hagen (1884, Canad. Ent. **16**: 225) reported this species as overwhelmingly common and destructive to elm trees. The other example concerning the same species occurred in Kansas. G. A .Dean (1946, Kan. Agric. Expt. Sta., Circ. 234) drew attention to the severe attack of both larvae and adults of *C. scalaris* on American elms in the late spring and summer of 1944. *Calligrapha philadelphica* L. has been recorded from New York State by E. P. Felt (1933, J. Ec. Ent. **26**:47) as feeding abundantly on the foliage of the silky dogwood, *Cornus amomum* Mill., in the Bronx River Parkway near the Mount Vernon Railroad Station. Otherwise, there appears to be no record of *C. philadelphica* as a potential pest in park plantings, and the following notes are submitted as being of unusual interest.

[1] Received for publication December 4, 1948.

In Ottawa, about a quarter of a mile directly east of Dow's Lake, and just off the Rideau Canal to the north, is a small body of water called Brown's Inlet. Bordering the south side of the inlet and also along the canal as one travels west on the Federal District Commission Drive through the residential district to the Bronson Avenue bridge, are many clumps of ornamental dogwood shrubs (*Cornus* spp.).

On Sunday afternoon, August 22, 1948, an adult *Calligrapha philadelphica* was incidentally noticed on a dogwood shrub at Brown's Inlet. Many more were easily observed in the next few minutes. Six were seen on the upper surface of one leaf, but this was not typical of the population, which was scattered throughout the shrubs in ones and twos. During a search of about twenty minutes, seventy-five specimens were collected and it was estimated that there must have been hundreds present in the area. The leaves on many shrubs had been badly disfigured, undoubtedly in the main by the beetle larvae. This is probably an unusual infestation by a beetle which I have found otherwise only sparingly in a wild state on its native host, the red-osier dogwood, *Cornus stolonifera* Michx.

A LARGE STAGHORN SUMAC[1]

Rhus typhina L.

W. SHERWOOD FOX
London, Ontario.

MOST AUTHORITIES on North American trees agree that the staghorn sumac is generally to be classified as a shrub, though under especially favorable conditions it may become a tree. In some lists of Canadian trees it is not even mentioned. Any doubt that has lingered in my own mind as to the capacity of this sumac to attain the proportions of a tree in Canada has been banished since I acquired a summer home in Goderich, Ontario.

On the line between my property and that of my neighbor, and within less than two hundred feet of the edge of the high cliff overlooking Lake Huron, stands a staghorn sumac of impressive dimensions. Just how old it is no one can say: all we know is that it was *in situ* when the neighbor was a child more than fifty years ago. It is still healthy so far as outward appearances are concerned and has never suffered from a major injury such as the splitting of its trunk or the violent breaking of its branches. Several years ago a couple of its secondary branches were sawn off because they were pressing down upon the roof of the adjacent building and threatening to crush it in.

In form this tree is like a typical sumac shrub magnified several times. The trunk rises from the ground at an angle of about forty-five degrees; at a point about four feet above its base it divides into two main branches one of which three feet above the fork divides into three secondary branches; the foliage, springing characteristically only from the tips of the outermost branchlets, covers the framework of the tree with a broad lacey canopy. Altogether this tree is fascinating as a joy to the eye, as an unusual botanical specimen and as a source of shade.

At its base the trunk has a diameter of thirteen inches, a breadth that is maintained to the first fork. Even each of the secondary branches starts with a diameter of seven inches and as it rises tapers off very gently. Both trunk and branches have retained the contortions and undulations that are peculiar to the staghorn sumac in its shrub stage. The entire skeleton of this tree reminds one of a tall wooden scaffolding that has been twisted by a tornado but has been strong enough to resist being broken off.

With a surveyor I have calculated that the tree is twenty-four feet, two inches high. Its umbrella-like canopy of leaves measures trenty-eight feet across at its greatest width. So far as I can ascertain such dimensions have been equalled or exceeded only in the southerly areas of the species' range, for example, in the lower Atlantic States on the east and in Missouri on the west. In these regions the warmer climate and longer growing season encourage great size and longevity in trees.

The Goderich tree is far larger than any other I have known of in Canada. Its exceptional size seems to be the product of a combination of factors: for most of its life the tree has been protected from the strongest and harshest winds by two houses; an old well lying below it has assured it of an unfailing source of water; throughout its life it has enjoyed the general conditions which obtain along the coasts of the Great Lakes and which tend to produce in this narrow belt trees of great size and luxuriance. Photographs of the Goderich sumac have been made for the records and my neighbor has promised, should disaster befall the tree, to keep a cross section of the trunk for preservation in a museum.

[1] Received for publication August 27, 1948.

THE COMMON SNAPPING TURTLE (Chelydra serpentina) IN MANITOBA [1]

L. T. S. NORRIS-ELYE
The Manitoba Museum, Winnipeg.

THIS TURTLE is abundant in the rivers and lakes of Southern Manitoba, but its northerly limit is yet to be determined. It is known to occur in Lake Winnipeg as far north as Riverton on the west shore and Beren's River on the east side; records seem to be lacking for the north end of the lake. These turtles are abundant in both rivers in Winnipeg and also in certain lakes in the Whiteshell Forest Reserve in Eastern Manitoba, where they are said to reach very large weights. The only specimen that the writer has weighed was a female with eggs. This specimen weighed exactly 25 pounds.

The writer has had the opportunity of investigating the nesting habits this year and the observations made may be worthy of publication.

On Sunday, June 20, 1948, at about 10 p.m. (C.S.T.), a large female snapping turtle came up the bank of Sturgeon Creek, at its junction with the Assiniboine River, west of of Winnipeg, to excavate a nest and lay her eggs on the property of Mr. and Mrs. W. A. Duffield at 2206 Assiniboine Avenue, who made the following observations. Presumably the same turtle had started to excavate a nest at about 9 p.m. on June 18 but was disturbed; this excavation was only ten feet from the nest completed later.

The nest is on the northern bank of the creek, some twenty-five feet from the water and about fifteen feet above water level; it faces southwest and is entirely unshaded. It is on the rim of the bank which slopes southward about twenty degrees. A few inches below the nest the bank slopes at about 40 degrees.

Mr. and Mrs. Duffield saw the turtle start to excavate as it faced uphill toward the northeast, working with a hind foot. Between 10 p.m. on the 20th and 8 a.m. (C.S.T.) on the 21st the nest had been completed and 77 eggs laid. All surplus earth had been disposed of and there was nothing to arouse suspicion except a grassless patch of lawn three inches in diameter, very like other natural bare spots on the same lawn. In size, this turtle seems to have approximated that of the specimen in the Manitoba Museum which weighed 25 pounds. The latter turtle was collected by Eric Fisher on the bank of the Assiniboine River at Riverbend Girls' School on June 17, 1946, on her way to nest; 80 perfectly-formed eggs were taken from her. These two clutches confirm previous reports by other authors and make rumours of clutches approaching 100 less improbable. In July, 1944, W. A. Lockhart examined a nest at Obabikon Bay in the Lake of the Woods that contained 49 eggs, all laid in a single night and the turtle allowed him to handle her while she was laying. There are no details as to measurements or weight.

On July 21, the writer excavated the Sturgeon Creek nest with a spoon and took photographs in kodachrome. The first eggs appeared 4.5 inches below the surface and each egg was separated from its neighbour by earth, which adhered to all sides of each egg; the earth had become somewhat compacted and great care had to be taken to avoid injury to the frail shells. The nest was cleaned out entirely until undisturbed earth was reached. The eggs were white, spherical and measured 26 mm, in diameter.

The aperture of the nest measured three inches in diameter and the entrance was a cylinder of the same dimensions for three inches below the surface, at which point there was an enlargement toward the north and east only, covering an arc of about 150 degrees, thus forming an irregular shape like a round-bottomed flask; the bottom of the nest was slightly rounded. The maximum depth from the surface was 8.5 in. and the greatest diameter at the bulge was about 6.5 inches. After photographing the eggs, 12 were retained for experimental purposes and the balance of 65 were replaced, mixed with earth as well as possible and the nest closed. Later, a screen of fine wire was erected round the nest to a height of some 9 inches.

[1] Received for publication September 24, 1948.

Some of the eggs were re-buried elsewhere and have not yet (September 16) hatched; they have probably dried out. Others were buried in earth in a metal bucket, dampened from time to time and a 25 watt electric light bulb suspended above the bucket to give an average temperature of about 75°F. so as to hasten incubation; this was a failure and all the eggs dried out. One egg, after 31 days of incubation, was opened, the embryo photographed and preserved. This embryo was a faintly pinkish-white all over; the total length 34mm., nose to occiput 6 mm.; the relatively small and much arched carapace was distinctly formed, but the plastron could not be seen; legs and toes were formed but the toes were still fused together; the tail was tightly coiled and the eye large with the pupil well developed.

The first turtle to emerge from the nest appeared about 7.30 p.m. on September 5 and several more on the 6th in the morning and afternon.

When the writer visited the spot on the afternoon of the 6th the nest aperture was not fully opened but an exit measuring about an inch could be seen. At least seven turtles had emerged and tried to escape and then returned to the nest. After hatching, each turtle stopped at the entrance with the head and front legs exposed for about a minute, then emerged with eyes still closed and rubbed the eyes alternately with the wrists, when the eyes opened. They then all moved southeast toward the water; if removed and placed on the lawn facing north they turned and walked toward the water again. On emerging from the nest, they invariably moved toward the water and climbed the wire, using claws, chin (perhaps the tubercles were used) and, in critical moments, the tail tip was also used; an inward over-hang of the top of the wire was negotiated with difficulty and caused many falls, but other attempts to escape usually succeeded. There is no doubt that dozens had reached the creek, as the nest contained many fragments of discarded shells and the numbers of young and unhatched eggs did not account for more than about half the brood.

The newly-hatched young had a residue of the yoke attached immediately posterior to the centre of the plastron; this dried in about an hour after emergence from the shell and assumed the form of a rubbery button, probably due to the adhesion and absorption of moisture by the soil. When they were placed in water, the scar softened again and showed as a pinkish-white residue. The scar is now (September 16) much reduced but is still soft and whitish.

The turtles seem to be hypersensitive to changes in temperature as they were quite active in sunlight when a few hours old, but a cloud passing the sun, slowed down all activity even to the extent of making them lethargic; passing of the clouds brought about renewed activity.

At hatching a typical turtle measures as follows: Total length 75.5 mm.; tail 33 mm.; caparace length 26 mm., width 24 mm.; plastron length 18 mm., width 14 mm.; hind foot and longest claw 8 mm.; head length 14 mm., width (behind the eyes) 8.5 mm. Ten weighed 56.7 gm.

Several of the texts describe the young as being more vividly coloured than the adults; in these turtles this was far from being so. The general colour is that of nearly dry humus — a sooty chocolate, perhaps slightly paler ventrally; the caparace marginals are tipped with horn and claws are the same colour; the chin tubercles are dark horn colour while the iris is indistinguishable, being black; the egg-tooth is white. The mid-dorsum is noticeably arched at hatching (to accommodate the egg-shell) but becomes flattened in two or three hours after birth. All the margins of the carapace plates are considerably raised and the mid-dorsal line is a roof-like ridge over 3 mm. wide and raised at least 1 mm. The serrations on the posterior marginals of the carapace and the raised plates on the dorsal surface of the tail are very evident.

The rate of growth in captivity is slow at first; those measured on September 16 were only 80 mm. in total length and the tail remained at 33 mm. — an increase of 4.5 mm.

The yokes and albumen of newly-laid eggs are exceedingly tough and viscous, being difficult to blow even through a large aperture; the shells are soft when first laid but soon harden slightly; the empty shells are not very firm and dent or collapse very easily but can be blown into a spherical shape quite easily by holding a finger over the air-exit hole. Empty shells must not be subjected to heat near a radiator; they will collapse to a fine powder.

Actual hatching was observed and photographed; one embryo was removed before the young had started to use the egg-tooth. The shell adheres so firmly to the carapace and to the plastron that it was difficult to separate them, even in small fragments. This adhesion may account for another observation — the obvious difficulty in escaping from the egg. After the egg-tooth has made a straight cut about 16 mm. wide, the head is protruded; after many struggles and rest periods, the front legs appear. The struggles, usually on the back, soon result in enlarging the hole as shell fragments become loose and fall away. As it takes an hour or more to escape, it is suggested that the moisture must have time to dry or oxidize before the separation of the shell from the turtle's body can take place.

It was also noted that in advanced stages of development of the embryo, a dent (inward) of the shell over the plastron appears; it is suggested that this is due to the absorption of the yoke by the embryo, resulting in a reduction in its size; this has the effect of drawing the shell inward where the yoke meets the inner surface of the shell. The carapace is too firmly attached to the shell to allow it to give away.

Of the 21 eggs brought back to the Museum, 19 failed to hatch; they had been out of the earth for at least 24 hours; the two that hatched, emerged during the same night. Apparently the unhatched eggs dried out, as they collapsed inward in various directions. Only one young turtle which hatched normally died, apparently due to a ruptured egg-yoke, perhaps resulting in some sort of infection. Mr. Duffield examined one egg on August 29 which had a hole about 1/16 inch in diameter from which emerged an orange-yellow larva, possibly of a beetle, about an inch long with a small black spot on the head and very active; the egg contents had been destroyed. Not realizing its importance, he did not retain the larva. This may be an instance of predation that has not yet been reported.

In captivity in a large tub with water level with a large slab of limestone, the young spend most of the time out of water; they take to the water frequently and remain submerged for an average period of 80 seconds; any longer submergence causes rather violent exertions to reach the surface. The observations of other people indicate that they can stay submerged for at least five minutes. They feed greedily on the commercial tropical fish foods and turtle foods and will attack struggling insects on the surface, though they were alarmed at the movement of sections of earth worms until they were about two weeks old. They quarrel and hold on to each others feet occasionally; the action of snapping is like that of the adults.

They swim strongly, employing diagonally opposite fore and hind feet in typical turtle fashion with the head well out of the water, the stroke being somewhat downward as well as backward.

It is hoped to learn something of their hibernation and to keep a few all winter out of hibernation and some in hibernation and compare the two rates of growth.

THE RED CROSSBILL AT PIMISI BAY, ONTARIO [1]

LOUISE DE KIRILINE LAWRENCE,
Rutherglen, Ontario.

THE RED CROSSBILL, *Loxia curvirostra,* has been present in this area several times during the last 10 years. In May 1939 a single bird was observed carrying a stick in its bill, but later disappeared and was not seen again. In 1940 a flock of about 10 to 15 birds was attracted to our backyard by a patch of snow discoloured by dishwater. These birds were first seen during the latter part of January and stayed some weeks, coming to feed rather regularly on the discoloured patch of snow. In 1945 Red Crossbills again appeared in the region. They were first seen on January 18 and disappeared after June 6. The greatest number of birds seen any one day during this period was 15. On August 28, 1947, Red Crossbills re-occurred in the area. They made irregular appearances throughout the Fall months and it was not until December that it became evident an invasion, not only of Red Crossbills, but of other species of the family Fringillidae, such as Evening Grosbeaks, *Hesperiphona vesper-*

[1] Received for publication November 18, 1948.

tina, Purple Finches, *Carpodacus purpureus,* Pine Siskins, *Spinus pinus,* American Goldfinches, *Spinus tristis,* and White-winged Crossbills, *Loxia leucoptera,* was taking place in unusually great numbers. This paper is based mainly upon a study made of the Red Crossbill during the Winter 1947-1948 and the Spring 1948.

I wish gratefully to acknowledge the assistance and encouragement given me in the present study by Mr. W. Earl Godfrey of the National Museum of Canada, whose interest did much to focus my observations on the species in question. To Dr. Oliver Hewitt of the Dominion Wildlife Service I am indebted for valuable advice as well as for help in the identification of some of the nesting trees. I owe most grateful appreciation to Dr. J. M. Speirs and Mrs. Doris Huestis Speirs who have read and edited this manuscript and whose continuous guidance in my studies of Nature and birds has helped me to bridge untold pitfalls of ignorance. Finally, I owe thanks to Arnold James who showed exceptional care and discernment for his age in the assistance he gave me climbing the trees to take measurements, examine the contents of the nests and eventually to collect them.

Pimisi Bay is a small lake located in the township of Calvin, 26 miles east of North Bay. At its north end the Mattawa River runs through the lake and the Trans-Canada Highway crosses its southern end. The river, which flows out of Talon Lake, half a mile west of Pimisi Bay, in a 75 foot drop, has cut itself a deep gorge through the rock and is banked on the south side by precipitous cliffs, about 150 feet high. The land beyond is extremely rough with outcroppings of pre-Cambrian rock formations, ravines cut through by small creeks, and innumerable boulders of various sizes thrown about in mighty disorder by the geological ages. Second growth forest covers the land, which has survived the ravages of several fires as well as the almost complete denuding of the virgin forest by lumbering activities. The ground is criss-crossed by windfalls and slash, in places all but impenetrable. The north side of the river and Pimisi Bay is as wild in character and stretches uninhabited for miles northwards, rich in smaller lakes, creeks and swamps.

The forest around Pimisi Bay consists mainly of white pine, *Pinus Strobus,* red pine, *Pinus resinosa,* smaller stands of jackpine, *Pinus Banksiana,* balsam fir, *Abies balsamea,* white cedar, *Thuja occidentalis,* white spruce, *Picea glauca,* and black spruce, *Picea mariana.* These evergreens are more or less intermingled with deciduous trees, such as white and yellow birch, *Betula papyrifera* and *B. lutea,* and aspens, both *Populus tremuloides* and *P. grandidentata.* The undergrowth is composed of various maple species, willow, alder and a variety of other shrubs.

My home is situated on the shore of Pimisi Bay, just north of the Trans-Canada Highway, and I have been able to follow the activities of the Red Crossbills in the field from day to day. Here I operate a small banding station, in winter, perforce, confined to 10 square feet outside the kitchen window. Its main feature for several years has been a saltlick, a block of rocksalt placed on an old cedar stump. When I became aware of the presence of the northern finches, whose taste for salt is well known, this saltlick was dug out of the snow. Beside it I placed a four-cell Potter-type trap and a little below it a draw-string trap. I announced the saltlick to the birds by throwing coal ashes and dishwater around it; and it did not take them long to respond to the enticement.

The appearances of the Red Crossbills have always taken place in years when the evergreens produced a particularly great abundance of cones. In the Fall of 1947 the trees in the Pimisi Bay area stood weighted down with such huge clusters as I have never seen in the 14 years I have lived here. The white spruces, for instance, literally drooped with cones down to the middle branches. The birds first attacked the balsam firs, whether because they liked these seeds best or because the upstanding cones were the easiest to pick I cannot tell, and by the end of December, already, all that was left of their fruitful glory were the main stems of the cones looking like empty bobbins and the ground beneath littered with fallen seeds and husks. When the snow melted, these seeds all over again became an important source of food for the birds.

PRE-NUPTIAL ACTIVITIES

In certain places on the highway mixed flocks of finches began to appear in early December. It was at this time that the sanding of the roads with chlorided gravel began. In spots the frost broke up the surfacing and here the salted gravel collected. These places and the hills where sanding was frequent were

Fig. 1. Nest of the Red Crossbill.

sought by the birds, provided the sides of the road afforded good cover for escape. How far the birds travelled to these chosen spots I cannot venture to guess; but when I happened to be out on the lake, at least a mile from the highway, I counted easily dozens of flocks of birds flying high from parts of the forest at least a mile farther on, birds heading for the highway, coming and going especially in the early mornings and during the forenoons.

On the road the birds sat in dense groups, each species fairly well keeping together. The Red Crossbills, which were not numerous at first, usually associated themselves with the Pine Siskins, a social preference also mentioned by Mierow (1946). But they came and flew away in their own closed flocks. Once down on the road, the birds became absorbed in their salt-eating and all but oblivious to the traffic speeding by. I once saw a female Red Crossbill which did not move until the car was upon her, and thus she was actually run over. Particularly heavy toll was taken of both species of crossbills and during the peak of their flocking on the roads it was not uncommon to find half a dozen dead birds several times during the day within half a mile.

The Red Crossbills ate not only the grit but the snow half melted by the salt both on the highway and at the saltlick. They put their crossed bills sideways and lapped it up with their tongues. In killed specimens which I sent to the National Museum of Canada the stomachs contained considerable fine gravel (Godfrey, in litt.), which apparently was mixed with the snow. At the feeding place the Crossbills also ate coal ashes on which salt had been thrown. They showed great liking for soapy dishwater, as previously mentioned, and the snow discoloured by the dog's urine. This latter taste of Red Crossbills was earlier brought to my attention by P. A. Taverner in a letter of April 26, 1943, and corroborated by my own observations. In 1945, however, the Crossbills were mostly seen clinging to our cobble stone chimney, pecking and eating the mortar.

The regularity with which individual birds ate salt was not possible to ascertain in spite of colour-banding, since a colour-banded bird might have visited the highway between appearances at my saltlick. Observations seemed to suggest, however, that salt-eating is not an everyday necessity. During snow storms and rainy weather little or no salt-eating was indulged in, but, on days immediately following, birds visited the highway and the saltlick is markedly greater numbers than usual. One day I came upon the idea of putting small dishes of water in the traps, thinking that so much salt must make the birds thirsty. The effect was quite surprising and this "bait" accounted for at least three-quarters of the 339 Pine Siskins I banded during the Winter and Spring and of most of the crossbills. Owing to their crossed mandibles, the Crossbills drank by putting their bills sideways to the water and then lapping it up with their tongues, not like other birds by dipping the tip of the bill and lifting the head to let the water run down the gullet.

The reason or reasons for the salt-eating in the Red Crossbill and other kindred birds is an unexplored field of research upon which I dare make no conjectures. Observations suggest, however, that there is some connection between the salt-eating and the breeding cycles. At any rate, the Red Crossbills seen during the Fall months of 1947 were noted neither at the highway nor at the saltlick but feeding in trees and pecking grit at gravel pits. The first Red Crossbill observed at the highway on December 10 was a male in song. After that their numbers steadily increased until a peak date was reached on March 22 during the height of their breeding season with a count of 60 birds coming and going to and from the highway and the saltlick.

By the middle of January the pairing of the Red Crossbills became an established fact. Birds then began to appear in single pairs rather than in flock, or in small groups of 2 or 3 pairs. One pair, which was often seen at the saltlick, was particularly interesting in that the male was an individual in greenish-olive plumage with shining yellow-bronze areas on head, neck, breast and rump, those on the head and rump being faintly tinged with red. The female was in unusually dull greyish-olive striped plumage, with dull golden areas. At first I took them to be friendly females travelling together, but late in April this apparently immature pair showed up with a flying young.

Courtship-feeding was first observed on February 3 when a male offered his female salted grit. I also noted it on February 22, and this time the male tendered his mate an aspen bud. During early March several pairs of crossbills were apparently establishing territory in a certain place on the south shore of Pimisi Bay near the mouth of the river and here I eventually found 4 nests. The birds were seen flying around in the tops of the trees with much singing, calling and chasing. It was here also, I first witnessed males in flight song. Around the female, usually sitting nibbling cone seeds in the very top of a tree, the male rose on vibrating wings in circle after circle, his brick-red plumage sparkling in the sun, uttering, at first, loud whistled notes which presently ran into an enraptured melody of clarion-like song. The performance usually ended with the female's sudden departure to another tree and the male in hot pursuit after her.

At this time there was still over 2 feet of snow on the ground and it was too early for carrying crust to form, preventing me from making further observations at closer quarters. Unfortunately, therefore, I saw neither the actual mating nor the beginning of the nest-building.

THE NESTS

I was only able to get through to the crossbill territory during the last days of March, and on April 3 I discovered the first nest. This nest, henceforth referred to as Nest A, was located in a lone white pine which stood on the crest of a high point overlooking Pimisi Bay. As I crawled up the hill the male called from the top of a tree below and the female left the nest. It was saddled on a horizontal branch 8 feet out from the trunk and 6½ feet from the end. The distance from the ground was 23 feet. The nest was made of pine twigs and some spruce twigs on the outside, next dead grasses, green moss and strips of the inner bark of white cedar. Inside it was lined with hairs and feathers. The outside diameter was 5¼ inches, inside diameter 2, outside depth 3½ and inside depth 1 3/16 inches. This nest was later abandoned and collected and is now in the National Museum of Canada.

Nest B was discovered on April 6 about 1000 feet north of Nest A. It was built in a red pine about 35 feet from the ground (estimated measurement since the tree could not be climbed without irons). This three stood on the periphery of a clump of tall trees on a slope about 30 feet from the lake. This nest was also saddled on a horizontal branch, about 3 feet out from the trunk and 1½ feet from the tip of the branch. A pair of Crossbills were nearby, the female taking nesting material from an old nest of a Red-eyed Vireo, *Vireo olivaceus*. None of the birds were actually seen at the nest, which was, or later became, abandoned, but judging from the structure and situation as well as the newness of appearance it seemed undoubtedly to be the nest of a Red Crossbill.

Nest C was discovered on the same date. This nest was located between Nest A and B at a distance of 300 feet from Nest B. It was built deeply seated in the fork of one of the middle branches of a white spruce, very well concealed in a clump of small bushy branchlets. It was at a height of 28 feet from the ground, 4 feet 5 inches from the trunk and 3 feet 9 inches from the tip of the branch.

When collected this nest was pulled entirely out of shape by long usage whereby measurements would be misleading. A greater amount of the inner bark of white cedar went into its structure than into any of the others. Apparently this had been gathered from a small stick found near the tree with identical fine strands of bark hanging from it. A few stalks of dead grasses, the same kind of stiff material used quite often in this area by the Wilson's Thrush, *Hylocicla fuscescens,* were interlaced with the strips of bark. The inner lining seemed to have been made entirely of *Usnea*; I found neither hairs nor feathers in what remained of it. The nesting tree stood on the northward slope towards the lake at a distance of 50 feet from the water's edge. It was surrounded by younger trees, 98% evergreens, mostly white pines and white cedars. On the northwest side a small rivulet trickled through a maze of windfalls and a thicket of cedars amid cushions of sphagnum moss down to the lake, this henceforth called the lake-area. The nesting branch pointed out towards a ravine-like clearing on the south-east side. (The choice of nesting branch of all three nests B, C and D had in common this peculariity of facing a clearing.) At the time of discovery of Nest C incubation was in progress.

Nest D was discovered on April 9 when the calling of the birds, presumed to belong to Nest B, was heard continuously during a watch at Nest C. Going to investigate, I found this nest in a white spruce which stood 75 feet south of Nest B. It was placed 4 feet out from the trunk and 3½ feet from the tip of the branch, at a height of 32 feet from the ground. This nest was beautifully made with an outer structure of dry spruce twigs, a pattern found in all the nests collected. Next came strips of the inner bark of cedar intermingled with green moss and *Usnea.* The inner lining was made of a few pine needles, a thick layer of hairs from the white-tailed deer and *Usnea.* The outer diameter was 5½ inches, inner diameter 2, outer depth 3 and inner depth 1 10/16 inches. The difference between the measurements of Nests A and D possibly was owing to length of service.

The nest was securely interlaced with the leaves and twigs of the nesting branch but not as well concealed as Nest C. It was half saddled on the branch and a supporting branchlet. The tree stood in a hollow, surrounded by white and red pines and facing a clearing to the north, which at a distance of about 100 feet sloped steeply down to the lake. This nest is now in the collection of the Royal Ontario Museum of Zoology.

NESTING BEHAVIOUR DURING INCUBATION

The pair of Nest A abandoned their nest soon after I discovered it. What was in it, if anything, remains unknown since the birds behaved so nervously at my approach that I thought it better to delay investigation. When collected the nest was empty and it presented so unused a condition in comparison with Nests C and D that it seems doubtful incubation or even egg-laying could have progressed very far.

Unfortunately I spent only a little over 8 hours watching at Nest C during incubation. This was a perfectly normal nesting and the only one brought to completion, undoubtedly due to the birds' artful concealment of the nest. Although I came to bless this effective screening in the end, I was highly elated when I found the fairly obvious Nest D and decided forthwith to spend most of my time there where I could more easily follow the activities of the birds. It happens, therefore, that I was never able to outsit the female of Nest C and thus, with regret, I can present no record of a full attentive period. What notes I have concern 4 interrupted periods, of which the shortest was 92 minutes and the longest, the day before hatching, lasted 181 minutes. Only once during these 8 hours did I see this female leave the nest for 9 minutes.

I spent almost 18 hours with the pair of Nest D before it was finally abandoned. The male was an immature with his red plumage still showing many greenish patches, particularly on the breast and forehead. The female was a rather excitable little individual, an unusual trait in a Red Crossbill. It is probable that egg-laying had not been concluded when I first discovered the nest and that this may have accounted for her irregular attentivity in the beginning. Later on something must have happened during my absence, which caused the strange fussy and nervous behaviour commonly shown by birds that are gradually induced to abandon their nests. On April 17, 8 days after discovery, I saw a Crow, *Corvus brachyrhynchos,* with something that looked like an egg in the bill, flying away and the Crossbills sitting in the treetops nearby showing distress. Investigation of the nest that day disclosed 2 eggs. But the birds were never again seen at the nest, although they

remained in the neighbourhood for a short time. When the nest was secured a month later a pierced eggshell was found in it.

At both nests only the females incubated. From the time of the courtship the duties of the male consisted mainly of the feeding of his family. Throughout incubation the males of both nests fed the females at regular intervals. In a species whose breeding season falls at a time when the temperature at night is often below zero and not far above freezing during the day and where only one of the sexes incubates, the feeding of the female on the nest is, of course, a practical way to promote success.

The male always fed the female by regurgitation. Actually he regurgitated small balls of food which were passed to the female and I saw from 3 to 30 such balls of food offered at one time. The frequency of the feedings averaged once in 2 hours and 10 minutes at Nest C and once in 3 hours and 1 minute at Nest D.

At both nests the feedings of the female were accompanied by elaborate ceremonies. The male approached the nest calling loudly, "plittplitt . . . plittplitt". As soon as the female heard him she gave the same call a couple of times and it often happened that she announced the coming of the male before I was aware of his approach. That the female knew the individual call of her own mate was evidenced by the fact that she remained silent and unmoved when other crossbills on their way to and from the highway often passed overhead giving the same loud calls. As the male drew closer the female broke into a continuous chattering foodcall "tchetetetetetet" which grew louder and more excited the closer he came and, as he withdrew, diminished into a soft sweet chatter. It reminded me of the game children play searching for hidden objects to music. This vocal exchange between the male and the female is so characteristic and infallible that any observer finding himself in the neighbourhood when the female is being fed cannot possibly miss being led directly to the nest of a Red Crossbill.

As the male alighted on the nesting branch the excitement of the female knew no bounds. She fluttered her wings and threw back her head and for solid minutes the male stood over her and gave her ball after ball of food which he had spent hours collecting. When he finished he hopped away giving softly whistled conversational notes, "whuittwhuitt . . . whuittwhuitt", and wiped his bill thoroughly. For a while he remained, sitting on a favourite perch in the top of a pine, calling softly to his mate all the time while she answered him with her naive chatter. The female of Nest D often became so excited by the presence of the male that she left the nest and crept towards him in a childish way, begging with her wings a-tremble. Where they met he stood over her and fed her.

The female of Nest D was generally very active on the nest. Time and again she turned the eggs and, while eggs being incubated in cold weather probably need to be turned often, she certainly overdid the chore. When she grew tired of sitting she hopped up on the branch, picked a few mites amid the needles and stretched her legs through her wings. Then she settled again and fell asleep with her head tucked under the wing.

At Nest C the female sat deep down in her nest and only at long intervals she shifted around or turned the eggs. (At both nests the eggs were turned with the bill and I often heard the soft click of the bill coming in contact with the shells.) This bird was extremely hard to flush and when Arnold James climbed the tree she refused to leave. Only when he was within 3 feet of her and began gently swishing the branch above her to make her get off, she reluctantly departed. Four minutes later she was back while we were still in the midst of taking our measurements.

Normally the females never left the nest without the males being present. Then they flew straight out and flung themselves into the air with loud calls, soon followed and escorted by the males. The same call notes announced their return. Generally the birds alighted in the top of the nesting tree. While the female slowly descended through the branches, slipped along the nesting branch and slid into the nest, the male remained on his lofty perch, the shine of his brick-red plumage blending with the winter-burnished tints of the pine needles and opened cones. For about 5 to 16 minutes he would remain near and soft chatter and muted whistled answers went on continuously between the devoted pair until the male, bound on another foraging tour, swung high over the treetops out over the lake with a few loud calls. Then the female sank back on her eggs silent.

THE YOUNG IN THE NEST

It was a piece of pure luck that we happened to investigate the contents of Nest C

TABLE 1

ATTENTIVITY AND FEEDINGS AT NEST C AFTER YOUNG HATCHED

Age of young (days)	Obs. time minutes	Temp. °F	Attentivity		Feedings			Rate per hour
			Off min.	On min.	Young by ♂	Young by ♀	♀ by ♂	
1	300	40-55	10	290	2	3	2	1.0
2	200	47-46	—	200	—	3	1	0.9
3	300	40-51	90	210	—	4	2	0.8
4	305	34-50	126	179	2	5	2	1.6
5	210	66-70	206	4	5	5	—	2.9
8	360	46-65	347	13	6	4	—	1.7
9	240	56-60	234	6	3	3	—	1.5
10	300	29-48	300	—	3	3	—	1.2
11	130	57-54	130	—	3	2	—	2.3
12	120	52	120	—	1	2	—	1.5
13	210	36-40	210	—	3	2	—	1.4
15	300	30-55	300	—	4	3	—	1.4
16	315	30-65	315	—	5	5	—	1.9

TABLE 2

PERIODS OF ATTENTIVITY DURING INCUBATION AND WITH YOUNG IN NEST C

Date	Age of young (days)	Incubation		Young in the nest	
		On min.	Off min.	On min.	Off min.
Apr 9	—	124*	9	—	—
		92*			
Apr 17	—	181*	—	—	—
Apr 19	1	—	—	290*	10*
Apr 20	2	—	—	200*	—
Apr 21	3	—	—	104*	65
				48	25
				58*	
Apr 22	4	—	—	67*	80
				94	46
				18*	
Apr 23	5	—	—	4	210*
					5*

Note: asterisk denotes interrupted periods.

(Tables 1, 2) on April 17 when we found the female sitting on 3 eggs. For on April 19, when I arrived at 7.10 a.m., the birds, a minute later, returned from a foraging trip and the male immediately went to the nest and there fed the young. Thus the hatching date must have been April 18.

By this time I had moved my observation post across the ravine-like clearing from whence I could conduct my espionage on family C to good advantage. From here I had a fairly clear view of the nesting branch which extended in a long petrified dead end pointed in my direction and inside the canopied green vault I could discern the faint outline of the rim of the nest. I sat wrapped in a greenish steamer rug between two windfalls. It took me some time to achieve a way of steadying my binoculars on knees and elbows at the crucial moments when shivers from cold and long sitting had a tendency of keeping them wavering annoyingly around the exciting objective.

The first day in the life of the young was cloudy with the thermometer at sunup near freezing after a snowstormy night. Ten minutes after the male's feeding, as related above, the female came to the nest and fed the young, after which she settled to brood. From then on her attentivity was practically uninterrupted, and when I left, 5 hours later, she was still on the nest.

The male was absent foraging for 2 hours and 40 minutes. He returned, calling loudly, and the female hopped out from the nest to meet him. The male entered from the dead end of the branch and fed the young while the female perched on the opposite side and watched. When he finished, the female covered the young and the male then passed her several balls of food which she eagerly accepted, wings fluttering.

In the 2 hours' interval following the feeding, the female quite often perched on the rim to rearrange the nest. She ate the droppings and once or twice she fed the young from the contents of her crop.

When the male returned the second time 2 hours later, the female remained brooding and the male came down and fed her 13 times. At these feedings the birds followed the same ritual as during incubation. A few minutes after being fed the female, in turn, fed the young and cleaned up the nest, eating all the droppings. The male remained near for 16 minutes, calling softly from the top of his favourite pine, and she answered him with her soft chatter, "tchetetetetetetet".

The second day followed much the same pattern of behaviour, but on the third day the female began to leave the nest more often and for longer periods. On the fourth day the female spent very nearly as much time off as on the nest (see Table 1). At this time I would have given much to see how thick a covering of natal down those young possessed to enable them to stand so much cold air. However, it may be presumed that in a nest so deep and so warmly lined as that of the Red Crossbill, the young must nestle

together fairly comfortably. Although their absence sometimes lasted more than an hour, the parents apparently did not cover the young with any material.

When the young were 5 days old a great change took place in the programme of the day. The female practically ceased brooding altogether. As a logical consequence there was no further need for the male to feed the female and this, in turn, caused the cessation of the feeding ritual. Instead of announcing their arrival with loud calling as during incubation, the birds now approached the nest extremely furtively and in utter silence. I had to be ever on the alert not to miss them. Only when the birds found themselves at considerable distance from the nest they resumed their habitual conversational notes among themselves; thus I could sometimes hear them before they approached, or as they departed southwards in my direction.

The parents shared equally in the feeding of the young and they came and went always together. On rare occasions the birds alighted at the nest together because there was little room for both to move about in the nesting alcove. The rule was that the male fed first and the female waited until he had finished and an odd time one of them might slip the young an extra ration. Both birds fed by regurgitation which continued even after the young left the nest. The male most often entered by the front door, hopping along the dead end which he used to wipe his bill on after he finished. The female preferred the backdoor where she slipped through green curtains, entirely in keeping with her own colours. After feedings the birds very often flew down into the lake area and, although it was impossible to follow them through the thicket and against so dark a background, they probably went down there to drink. So much regurgigation would make any bird thirsty.

As shown in Table 1, the rate of feeding reached its high point on the fifth day. But since the curve throughout the nesting presents a rather even trend it seems likely that its variations are due to the facility at certain times of the day as well as during certain (warmer) days of obtaining food rather than to other reasons. Because both birds fed the young at the same time, the intervals between the double feedings were quite long, averaging 67.2 minutes. As the young grew older they would show impatience at overdue feedings by moving about and sometimes gaping.

It was on the fifth day that I beheld the young for the first time and knew that all three eggs had hatched. They looked light grey inside their green alcove and their bills almost silvery. Later I found out that the targets they presented to their parents at the feedings were throats whose appearance vividly reminded me of a crimson fringed sweet-william. In the beginning, the gaping reaction seemed to be released by the same agent as Tinbergen found in young thrushes (Wilson Bull., 1948), i.e. "the slight jarring of the nest", since the young even with eyes opened could not see the male when he alighted on the dead end and were seen gaping as soon as this happened. Later, apparently, the gaping occurred upon sight stimuli, the bright-coloured father alighting in another tree within sight, and auditory stimuli, the very soft call-note given by the female on certain occasions. When the young were 15 days old I heard their food-call for the first time by going closer to the tree at feeding time. It was similar to the female's, only thinner and weaker.

Where the male roosted during the night I was unable to find out with certainty. I only knew that he ceased his activities at sunset and on the night I watched their going to bed it was not he, but the female who slipped on the nest at 7 p.m., a little after the sun had gone down. I did not see her leave again. The next morning at 4.30 a.m. she, apparently, was still on the nest. At 5.20 a.m., just as a rosy light came into the sky, the male came to his favourite pinetop and called softly. Like a shadow I saw the female slip off the nest and the male came down and fed the young. How he found the food for that first meal in the morning twilight was and remains a mystery.

THE YOUNG LEAVE THE NEST

The 17th day dawned mild and overcast. The young now stood up in the nest and flapped their wings and I could even hear their food calls from across the ravine. It seemed to me that soon the time ought to be due for them to leave and my one great desire was to witness that important event. But the hours passed and nothing whatever happened but the parents' steady coming and going and the young rising after feedings, flapping their wings.

It was near 10 o'clock in the morning when both parents came into the top of the nesting tree. The male, as usual, went down and fed the young while the female remained perched in the very top. His task finished, the male flew down into the lake area and then returned to the top of the tree. Meanwhile, the female began to call softly. She started to descend from branch to branch, calling all the time and flapping her wings. It seemed to me that she was suggesting to the young to leave the nest. That interpretation, however, was never proved.

Blue Jays, *Cyanocitta cristata bromia,* had been touring the woods off and on all through the nesting season and once there had been a great disturbance nearby when they raided the nest of a Pine Siskin. Just as the female alighted on the branch above the nest a Blue Jay called. The female, apparently, did not hear the Blue Jay the first time, her attention fixed on the young. But the second time she heard it and she rapidly departed, giving the alarm-note. The male immediately followed her and both birds called loudly some distance from the nest. At that very second the Blue Jay alighted in the tree just below the nest.

May the unscientific behaviour of this naturalist be forgiven, but at this crucial moment I could not endure so abrupt an ending to this fascinating crossbill story, a sentiment I could well have spared myself leaving nature to take care of its own. I clapped my hands and chased the loudly protesting Blue Jay away from the nest. The crossbills ceased calling and flew off.

Twenty minutes later the crossbills returned. The female flew down and hopped around the nest in evident distress. I stood tense watching until my neck ached. Finally, she flew into the nest—and out again—and at that moment both she and I realized that the young were gone. A few minutes later the male came down and, having kept his head much better than both the female and I, he searched and found one of the young tucked away amongst the spruce twigs quite close to the nest. He fed it and carried away a dropping. I have never gazed upon a dropping with greater relief.

Twenty minutes later the Blue Jay returned. He went to the nest, found nothing and flew away calling raucously. The crossbills somewhere beyond gave soft alarm notes. When the last call of the Blue Jay trailed off in the distance the birds returned. They searched the nest, in and out, calling softly. No answer. They flew off. They returned again and the male called loudly. Still no response from the young. He came to the tree and called. This time the young answered and the male found a second one, hidden on another branch, and a little later he found the third one. The female was still too upset to do anything but sit in the top of the tree, calling softly and flapping her wings.

The next day I found the family in the lake area. One young, a small stubby-tailed fluffball, sat on a twig near the lake. I hid to let the adults point out the other ones to me.

I was surprised at two things, first, that the young were so small after so many days in the nest and, secondly, that they had been able to betake themselves so far being so uncertain on their wings. They could not fly as well as some fledglings of other species normally can upon leaving the nest and their judgement of distance was the poorest. After short flights, which lost almost all the altitude their last perch afforded, they alighted by near misses and then crawled into position like parrots. It is quite possible that even on the 17th day they left the nest too early.

With no difficulty I captured one of them. Not expecting to find them again after the episode the day before, I had no banding equipment with me. So I carried the young one home where I could examine and band it in peace.

The young was fully feathered and measured 4 inches in length. It was heavily striped all over in lighter and darked shades of grey and every wing and tail feather was edged with light cream-buff. The breast was pure white with short, very dark stripes. The belly was yellowish, a dull yellow, the rump slightly brighter. Natal down still clung in tufts about its head and shoulders. Its bill was a light silvery grey and the mandibles were not crossed.

Returning the bird to the place where I caught it, I brought with me bands and a trap. I put the young in the trap and waited for the return of the parents.

As during the incubation loud calls once more announced their coming and the young promptly answered. The parents fed the two free fledglings, but took no notice of the one in the trap, which called loudly for food. While the adults went foraging again I, there-

fore, captured the other two and put them also in the trap. The young crawled up and down the wire and as the parents came back they gave strong food calls.

The parents went straight to where they had left the young last, but not finding them there they searched for a while finally to discover them in the trap. The female soon came down and tripped the trap shut upon herself. But even with his whole family imprisoned, inducement enough one would think for any family father to let caution go by the wind, the male steadfastly refused to enter the one compartment open for him. By then the young had already missed two meals and I decided to begin the banding.

The female, very excited, screaming and biting, was difficult to handle during the banding. With some manipulation, however, I obtained her measurements; bill 0.62, wing 3.50 and total length 6 inches. Her plumage was greyish olive-green with the utmost tips of the feathers on head, breast and flanks tinged with faint yellow and the rump somewhat brighter, but not as brightly yellow as observed in some other females.

On the day after the banding the weather turned bad with sleet storms and continuous rain. As I finally ventured out through the sopping wet woods on the second day I found no trace of Family C, all banded with blue bands. Although as nestlings the young undoubtedly could be considered extremely hardy, it seems improbable that all these tiny fledglings survived this prolonged spell of cold and wet weather away from the shelter of their nest.

With the young out of the nest the parents located them by their food calls. They fed whichever young they found first with no individual young assigned either to the male or the female as is sometimes the case with other species, such as the American Robin, *Turdus migratorius*, or the Chestnut-sided Warbler, *Dendroica pensylvanica*, (Lawrence, 1948). In the crossbill the family relationship is somewhat different due to the close companionship between the mates and may, perhaps, account for this circumstance.

The reaction of the young to capture was interesting. They showed no fear as I approached and two of them let me put my hand over them without the least protest. The third one dropped from its perch and crouched in the moss where I picked it up without further ado. Yet when the Blue Jay invaded their nesting tree they apparently knew enough miraculously to disappear out of sight. It may be of some significance that when I captured the young the stimulus of the parents' alarm notes was lacking.

SANITATION OF THE NEST

The male and the female shared the task of keeping the nest clean. Most of the droppings were eaten and only towards the end of the nesting, when droppings became large and plentiful, were the birds seen carrying away an odd fecal sac which they generally ate later. But in spite of the efforts of the parents, Nest C presented a very untidy picture after the young left. The whole rim of the nest as well as the twigs around it were plastered with dried white splashes which the young had expelled over the border. I have observed this to be the case also with the nest-sites of the Purple Finch after the young have left.

DEFENCE BEHAVIOUR

The Red Crossbill is a bird of a generally placid nature. The characteristic trait, which some naturalists call "tameness", seems to me rather an attitude of complete reliance in their protective colouring in wild birds. Even the male in his red plumage, that in the sun shone with the colours of an opened pine cone stained with gumdrops, in the dimness of the nest and in the shade of the trees became a faintly russet-green shadow, distinguishable only by movement and form. As to the young, no pattern or colour combination could have been more effective than theirs, since their first backgrounds were created by lichen-covered branches, twigs and tree trunks. In all situations, therefore, except when sitting on the road eating salt, the protective colouring of the birds was their best safeguard.

Consequently, in all defence and self-protection the birds followed the tactics of "freezing" and evasive action. At the nest, instead of going to attack, they sought to detract attention from eggs and young by flying away and at a distance sitting high in a treetop and calling loudly. Had the female been on the nest at the visit of the Blue Jay, I doubt she would have moved unless the predator had stepped on her, just as she refused to flush when Arnold climbed the tree.

Once when the young were 4 days old the male, sitting in his favourite pinetop after feeding, suddenly gave the alarm. The female

instantly ceased chattering. The male then swung himself down along the side of the burnished pinetop so that the pine came between him and the object of the alarm, much the same way as woodpeckers do. A moment later, I saw a Crow pursuing a Northern Raven, *Corvus corax principalis,* over the lake and as they disappeared out of sight the male resumed his erstwhile position.

Quite often strange Red Crossbills alighted in passing in the trees of Nest C and D. At such an occasion no bitter battles took place between the males. Instead the females took it upon themselves actually to hop the strange female out of the tree while the males stood by or escorted their respective consorts on their way. Territorial areas in the case of the Red Crossbills included evidently nothing more than the nesting tree itself. With regard to other species, a male Myrtle Warbler, *Dendroica coronata,* once happened to alight on the "dead end" just as the crossbill male was at the nest feeding the young; but seeing what was going on under the green canopy the warbler discreetly withdrew. At another time, a pair of Red-breasted Nuthatches, *Sitta canadensis,* meandered through the tree in their own self-assertive way. The male Crossbill, merely to show them they were trespassing, hopped them into another tree, which summary treatment seemed to annoy the male nuthatch a trifle. But there was no fight or actual chasing.

On the day the young were being fed in the lake area amid flutter and calls, the Blue Jay returned once more to the nest. Instantly the crossbill family grew silent and motionless and the Blue Jay departed, having heard, seen and got nothing.

FOOD HABITS

As earlier remarked, and apart from the salt-eating, the predominant food of the Red Crossbill during the winter was the seeds of cones. While the White-winged Crossbills, Purple Finches and Pine Siskins accounted for most of the cedar and balsam fir seeds, the Red Crossbills seemed to prefer those of the white pine. They apparently detached the seeds from the hanging opening cones and then crushed them and ate the kernels. On one occasion, I saw a Red Crossbill pick off the whole cone of a black spruce. The bird then held the cone against the branch with its feet while it opened the cone with the bill, letting the husks fall away, after which it secured the seeds with the tongue and ate them.

On several occasions, I saw Red Crossbills hop along the branches of the pines, much in the same way as Red-breasted Nuthatches do, searching for insects along the crevices of the bark. Putting the bill sideways, the bird pried out the insects with its rather thick mobile tongue. Once I observed this done by the female of Nest C. Another time, I saw the male catch a flying insect, flycatcher fashion.

On account of the deep snow and the extremely rough terrain, I was never able to follow the birds on their long swooping flights to their various feeding grounds to glean a notion of what exactly consisted the countless foodballs that I saw passed from bird to bird. It would have required a kind of magic carpet. Most often the birds went far across the lake where the forest stood thick in swamps and on the hills. Here, in spite of the great demands put upon existent food supplies by the unusual influx of wintering birds in the area, they must have found what they sought. Once I tried to follow them to a thick stand of spruce and pine half a mile up the river, in the direction of which I had seen them fly off. But when I arrived, puffing and panting, the birds were not there, and as I returned to the nest a little later they came swinging back home with their crops full of food from I know not whence.

Thus it seems clear that the frozen forest of the north provided plenty of food for these birds which would never pick a seed from the variety scattered around my feeding station. For instance, seeds of the evergreens, preserved both on the ground and in the cones; dormant insects, found in the crevices of the bark and amongst the spruce and pine needles; buds of aspen and birch, which, while apparently not an important food item, were eaten; dried and frozen fruits of shrubs and plants, (Taverner, 1938), such as cranberries, wintergreen berries and the berries of *Maianthemum canadense,* which were revealed in abundance on the nesting grounds as the snow receded, although I never saw the birds actually take them; a yield of foods, to be sure, upon which only the hardy breeds of the north could support life during the winter and, what is more, condition themselves for their early breeding season. Since by the method of regurgitation any edibles to a certain extent are processed to suit even the more tender digestive systems, a combination of all these foods must have been contained

in the foodballs, from which the female crossbills derived the calories necessary for survival and incubation and upon which the young throve and grew.

SONG AND CALL NOTES

At the time of the pairing the male apparently comes into song. As far as my observations show he has two songs, one a perching song and the other a flight song. During the height of courtship the one song is sometimes protracted into the other and thus a rather prolonged vocal effort is produced that lacks nothing in fervour and melodiousness. The perching song is loud and rather short. Peterson (1939) described it as shorter than the White-winged Crossbill's, which observation I had numerous occasions to confirm by direct comparison. It consists of whistled notes more or less interspersed with warbled phrases. The flight song is rather liquid, a passionate utterance of love by an exalted being. The male's period of singing is short and very sweet, for as soon as incubation starts he becomes entirely absorbed in other duties and his passion, now fulfilled, has no more need of musical expression.

The Red Crossbill's characteristic location note is a very loud rhythmically whistled note "plittplitt.....plittplitt". It was with this note that the male announced his arrival during incubation, while the female was brooding, and after the young left the nest, and the female answered with the same note. When one of the birds prepared to leave and, vice versa, when one of them perched after flight, it suggested to the other to do likewise using the location note. It corresponds, I believe, and is used as the Evening Grosbeak's "p-teer" (Spiers), the Purple Finch's "tuck-tuck". Besides this location call they had a similar but much softer note, "whuittwhuitt . . . . whuittwhuitt", which was of a conversational nature and which the birds used constantly as they travelled together, as they fed, as one waited while the other was feeding. It was this note that the female used when she perched in the top of the nesting tree and called to her young the day they left the nest.

The alarm note was a monosyllabic whistle, very soft, "lu . . . lu . . . lu", given between rather prolonged intervals. This note was always heard when something untoward happened at the nest and I also heard it on occasions when I surprised birds unaware of my approach.

As mentioned, the female's food call was a continuous "tchetetetetetetetet", which she uttered practically without interruption from the time the male arrived to feed her until he departed again during incubation and brooding. The American Goldfinch female has a similar sweet soft chatter at nesting time, which I have heard not only during incubation and brooding but also while she tries out nesting sites and builds her nest.

When out of the nest the young soon acquired a kind of location note corresponding to the adults' "plittplitt", possibly by imitation since it sounded thickish at first and improved with practice. They had also another note which I believe was the first form of the conversational note. In more developed young it sounded like a soft "choo-choo". Their food call was like the female's, but higher pitched, not continuous, and if possible more "childish".

To end this paragraph I would add that the rhythm so characteristic in the Red Crossbill's call notes is not always the same. The rule is two syllables given together between intervals, but sometimes 3 or 4 syllables are given without intervals and at other times just one at a time with intervals between each.

DISPERSAL

On April 27 the first juvenile appeared at the feeding station with its parents, the green male and the grey female. This was an almost fullgrown young bird with its mandibles slightly crossed. It was still begging and occasionally being fed. It had probably been out of the nest 2 weeks. If such was the case, this young must have been hatched some time during the last two weeks of March and the nesting must have begun in the end of February. Apparently only this one of the brood survived.

After this, young flying birds were noted all through May, some coming to the feeding station, some seen at the highway in various stages juvenility. I never saw more than 2 young with each pair of parent birds, which may perhaps serve as an indication that about half the number of young hatched survived. Later, either non-breeding birds or pairs from unsuccessful nestings (this conclusion drawn from the behaviour of the young) apparently joined the family groups and the flocks seen thereafter numbered usually 4 or 6 adults with one or two young birds. Then these groups, in turn, joined together and by the end of May up to 2 dozen birds were seen in a flock. On May 28 I noted the first young

birds eating salt and the adults that were with them at this time were definitely moulting. After June 5 the Red Crossbills were no longer seen in the region.

SUMMARY

The irregular appearances of the Red Crossbill in the Pimisi Bay region over a period of 10 years has apparently been governed by the supply of winter food, i.e. evergreen cones. In the winter of 1947-1948 the abundance of cones was unusually great and the birds appeared in greater numbers than previously observed.

If suitable nesting grounds are found in the vicinity of the winter feeding places some of the birds remain and nest.

Some of the birds come into breeding condition early in the winter, in some cases in early December. In connection with the beginning of the pairing, the males come into song and shortly afterwards courtship-feeding begins. The male has two songs, one a perching song and the other a flight song, both of considerable musical effect. The flight song is indulged in mostly after the nesting territory has been selected and probably continues while the nest is being built. After incubation begins the male's singing ceases entirely.

The nest of the Red Crossbill is well built, comparatively deep and thickly lined with moss, hairs and sometimes feathers. Thus the eggs rest deeply on the bottom and are to a certain extent protected from the cold in the absence of the setting bird.

Incubation lasts at least 12 days, probably 14 to 18 days. The female alone incubates and her attentive periods are, as a rule, continuous and long. During the day she leaves the nest a few times for short periods. There is no evidence of the bird covering the eggs during her absence in spite of the temperature often being well below freezing during the early nesting season.

After the young are hatched the female broods them for long periods without help from the male. As the young grow older the brooding time is gradually shortened. In the case of the nesting described in this paper the female practically ceased brooding on the 5th day. It is probable, however, that in very early nestings the brooding is continued considerably longer.

From the time incubation starts, the male's role becomes exclusively one of provider of food for the family. Thus he practically supports the incubating female by feeding her every 2 to 3 hours. After the young hatch he feeds the young as well as the brooding female. When brooding ceases the male and the female share equally in the task of feeding the young. The parents accompany each other foraging and, as a rule, they feed the young at the same time, the male first and the female waiting until the male has finished.

Apart from the courtship feeding, all feedings of both the female and the young in as well as out of the nest, are done by regurgitation. The feeding of the female both during incubation and while brooding is accompanied by a ritual, consisting of calls and answering food calls on the part of the female which crouches in an attitude of begging while the male feeds her. As soon as the female ceases brooding the ritual is also done away with, and the birds' comings and goings at the nest are marked by stealth and silence. Loud calling is resumed after the young leave the nest, now between parents and young, accompanied by begging and pursuit on the part of the young.

The young remain in the nest at least 17 days. When the young leave the nest their bills are not crossed but during the next following weeks the tips of the mandibles extend and cross as in the adults. The young are fed by the parents for at least two weeks after leaving the nest. There is no evidence of second nestings, not even after interrupted nesting attempts, at least not in the same territories.

When nesting was over the birds began to wander and one family group was joined by others. As flocking increased the birds in this area moved out of their winter and nesting grounds to new, and apparently better, feeding regions.

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OBSERVATIONS ON THE BIRDS OF THE CASUMMIT-BIRCH LAKES REGION OF NORTHWEST ONTARIO [1]

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CASUMMIT LAKE is but one of the innumerable bodies of water which lie in the backwoods bush country of northern Ontario. It is situated 100 miles almost due north of Sioux Lookout, in the Patricia portion of Kenora District, about latitude 51°30'N and longitude 92°20'W. It drains into Birch Lake which is considerably larger and lies about three miles to the south. Having been burnt over about 40 years ago, the country is largely forested by second growth spruce interspersed with birch and alder along the water courses.

Virtually unknown until 15 years ago when it was discovered by prospectors, Casummit Lake's sole claim to present recognition is the existence on its north-east corner of a marginal gold mine, at present called, "New Jason Mines", after several changes in ownership and name. The mine possesses a ball-mill which has been operated periodically during the past few years. Wastes from the mill have formed in the lake a slag-dump, a four-acre mud and sand beach which proved most popular to shorebirds although unfit for human bathing. The mine and the accompanying community of approximately 100 persons is supplied with hydro-electric power by a transmisssion line built in 1938 running from Goldpines on Lac Seul, 80 miles to the south-west.

My ornithological observations were made between November 4, 1946, and June 20, 1947, when I was resident physician at the mine. The territory includes only the immediate vicinity of Casummit Lake with an occasional trip through the forest to the adjacent northern shore of Birch Lake. I arrived at the mine by the last aeroplane flight before the fall freeze-up, and left less than a fortnight after the ice had gone out in the spring, perhaps the latest break-up on record. The intervening period comprised a moderately severe winter which reached its coldest point (—45°F) during the last week in January, and a delightful spring. The persistence of ice on the lake for seven weeks after mid-April does not refute the fact that spring arrived at that time.

1 Received for publication November 12, 1948.

The writer has received the assistance of A. G. Lawrence of Winnipeg and James L. Baillie, Jr., of Toronto, in making a permanent record of these observations. The region was entirely new to me, and my only reference book was the first edition of Peterson, "Field Guide to the Birds". This report is believed to be the only one ever made from this area. The nearest districts whcih have received previous ornithological attention are:

1. **Lac Seul** (75 miles south) where D. Blakeley and F. Waugh observed 97 species and made collections for the National Museum of Canada between June 24 and October 5, 1919.
2. **Favourable Lake** (100 miles north-west) where Clifford E. Hope observed 105 species and collected specimens for the Royal Ontario Museum of Zoology between May 30 and August 6, 1938. (Report in progress).
3. **Sandy, Weagamow and Caribou Lakes** (approximately 100 miles north) where Dr. J. Satterly made observations on 44 species of birds while engaged in geological work during the summers of 1937 and 1938. (Report on file in R.O.M.Z.).

Common Loon

Gavia immer. The bird was first seen on May 21 in the ice-free east bay, but not noted again until June 12 after which it was seen or heard daily.

Great Blue Heron

Ardea herodias. It was seen on one occasion only, April 28, when one rested for a few hours on the still-frozen slag-dump.

Snow Goose

Chen hyperborea. This species was seen only on May 15. Although other flocks of geese, some of them described as "white waveys" had been reported to me by the local inhabitants almost daily for the previous week or 10 days, this is the only record that I can verify. The flock of 200 birds was heard then seen at 4 p.m. C.D.S.T. flying in a north-easterly direction through a clear blue sky above the hydro-electric power line at

the east end of Casummit Lake. The flight was a constantly changing irregular wavy M & V formation. The migration route of this bird has not previously been traced between Minnesota and James Bay.

Blue Goose
Chen caerulescens. This species comprised about 15% of the flock of 200 birds described above under Snow Goose.

Lesser Scaup Duck
Aythya affinis. A pair was seen on May 17 on the open water of the east bay, but not recorded subsequently.

Common Golden-eye
Glaucionetta clangula. A male was seen on May 14, and two pairs on May 18. Three males were again noted on May 20.

American Merganser
Mergus merganser. Two males were seen at dusk on May 26, and during June a pair was seen on two occasions near the reedy shore of the bay or islands.

Red-breasted Merganser
Mergus serrator. One male was seen on May 18 in company with the two pairs of American Golden-eye.

Cooper's Hawk
Accipiter cooperii. One was seen on May 10 flying just above the trees at the eastern end of the lake.

Osprey
Pandion haliaetus. One was seen on June 12 over the east bay.

Sparrow Hawk
Falco sparverius. This species provided several interesting observations. One was first seen April 29 and daily thereafter. On May 2 it was joined by a mate, and they frequented the high-tension wires entering the area. On May 6, the male hawk was found dead inside the mill, and the next day the female was found quite emaciated and dead below the hydro-electric power line. However, on May 8, another male sparrow hawk appeared and remained a full week before being joined by a female. A few days later both birds left the area, and the only subsequent record of this species was a solitary male on June 6.

Spruce Grouse
Canachites canadensis. It is said to be fairly common throughout the forests of this region but my only record was made on May 10 when a male was flushed from the ground into a spruce tree on the Casummit-Birch Lake Portage. It remained there until the tree was shaken, then flew clumsily into the bush.

Killdeer
Charadrius vociferus. These birds were seen and heard daily after their arrival on May 6. Two or three pairs were constantly calling on the beach and the few acres of grassy clearing.

Ruddy Turnstone
Arenaria interpres. One was seen on June 3 when it alighted for a few seconds on the aeroplane wharf.

Wilson's Snipe
Capella gallinago. One was seen closely on May 18 running through the wet grassy area at the east end of the lake.

Spotted Sandpiper
Acititis macularia. A group of three was first seen on June 14. Several were noted the following day and at least one on subsequent days.

Solitary Sandpiper
Tringa solitaria. One was seen on May 20 wading in a small quagmire where an old corduroy road passed along the edge of the lake. One was seen again on May 29.

Greater Yellow-legs
Totanus melanoleucus. Of the several records of yellow-legs, all were identified as this species by the clear, penetrating, tri-syllabic cry. A flock of five was noted in the thin film of water overlying the sponge ice at the edge of Birch Lake on May 10. At Casummit Lake, some were recorded daily from May 14 until May 29, but none thereafter.

Semipalmated Sandpiper
Ereunetes pusillus. One was seen on June 3 only.

Sanderling
Crocethia alba. Two birds were seen on the mud-flats by the mill on May 20.

Herring Gull
Larus argentatus. A few gulls first appeared over the lake on April 22, and thereafter increasing numbers were evident on the ice and water daily. On May 4, at least 80 were present on Casummit Lake. About 20 remained throughout the spring.

Bonaparte's Gull
Larus philadelphia. A flock of about 20 visited the lake in the mid-afternoon of May 17, circled, tumbled and darted about, then departed without landing, towards the northwest about 5 minutes later. Five birds were seen the following day, but none thereafter.

Tern
Sterna sp. Three birds were noted on June 11 and one the following day. Although believed to be Common Terns *(Sterna hirundo)* they were not distinguished with certainty from Forster's Tern.

Nighthawk
Chordeiles minor. One or two arrived on June 5 and were subsequently observed each day.

Belted Kingfisher
Megaceryle alcyon. It was first noted on May 10 and one pair remained in the region.

Yellow-shafted Flicker
Colaptes auratus. Three were seen and heard on May 1, and several birds could be found daily thereafter in the area.

Eastern Kingbird
Tyrannus tyrannus. One was noted on May 19 and 20, but was not subsequently observed.

Alder Flycatcher
Empidonax traillii. A few birds were first observed on June 12, and the short, sharp, typical song was quite noticeable each following day.

Tree Swallow
Iridoprocne bicolor. A flock of about 10 birds arrived on April 29 and was seen and heard about the mine-shaft and water-tower all that day. The following day they had totally disappeared. (The arrival of Herring Gulls and Tree Swallows on April 29 was considered to be the first sure heralding of spring in the region). The Tree Swallows were completely absent for 10 days, then returned on May 10 and were continuously present thereafter. Between 50 and 100 were seen on May 20.

Canada Jay.
Perisoreus canadensis. The Whiskey Jack was the first bird which greeted me on my arrival at Casummit Lake on November 4 and it was seen occasionally during November. During the severest winter months of December and January no birds were seen. The first pair for 1947 was observed on February 11 and noted infrequently thereafter. A very dark individual (immature) was noted on June 15.

Raven
Corvus corax. The hoarse, rattling croak of this bird of the wilderness was our constant sign of bird life throughout the northern winter. The species was first noted on November 7 and two to six birds were seen almost daily during the following five months. The raven disappeared early in April, soon after the Crows arrived. One only returned to the area on May 3 and was seen daily after May 13.

Crow
Corvus brachyrhynchos. A few Crows were observed in early November, but the first for 1947 were noted on April 1. Several remained constantly in the region. The largest number observed was 30 on April 30. Crows provided one of the few breeding records; a pair nested in the tallest trees on the island opposite the mill.

Black-capped Chickadee
Parus atricapillus. Chickadees were not common, but a few were always present.

Brown-headed (Hudsonian) Chickadee
Parus hudsonicus. It did not frequent the area about the community, but one was seen on April 16 on the forest trail to Birch Lake, and it is believed that such birds were year-round residents in the denser, coniferous regions.

American Robin
Turdus migratorius. This welcome bird was first seen while calling from a tree-top at 6:30 a.m. May 2 after which it disappeared for ten days. After May 13 a few robins were residents in the area.

Hermit Thrush
Hylocichla guttata. One bird was seen on the cold morning of April 23 while snow was still on the ground, but was not recorded again until May 2 when one was heard singing. The only other record was made on June 14.

Olive-backed Thrush
Hylocichla ustulata. It was seen on only two occasions, May 26 and 29.

Eastern Bluebird
Sialia sialis. A brilliant male was seen once, May 3, investigating an old saw-mill on the property. A lone female was seen May 13.

Golden-crowned Kinglet
Regulus satrapa. This bird appeared on May 3, but remained for three or four days only.

Ruby-crowned Kinglet
Regulus calendula. The species was first noted on May 2 and arrived in increasing numbers until the middle of May. None were observed after May 20.

American Pipit
Anthus spinoletta. Five were seen on a grassy mud flat by the lakeshore on May 19.

Bohemian Waxwing
Bombycilla garrula. A flock of five was seen atop a 20 foot spruce tree at close range

on May 17. This was my first and only record of this bird.

Shrike (probably Northern)
Lanius sp. A lone bird was seen on April 30 and May 2. The diagnosis is only tentative since size is a dangerous differential point and no vermiculations of the underparts were noted.

Blue-headed Vireo
Vireo solitarius. It was seen on one occasion, May 15.

Philadephia Vireo
Vireo philadelphicus. On May 17 two individuals were seen at widely separated points in budding shrubbery along the stream and lake. Both had markedly yellowish underparts.

Tennessee Warbler
Vermivora peregrina. Several were seen singing very loudly during June 14, and the bird was recorded daily thereafter. It appears that the region would be the breeding area for several pairs of the species.

Nashville Warbler
Vermivora ruficapilla. A single record was made on June 14 and 15.

Yellow Warbler
Dendroica petechia. One was seen on June 4, and varying numbers were identified daily thereafter. Several pairs seen in mid-June would indicate that they breed in the area.

Myrtle Warbler
Dendroica coronata. One male was seen on May 1 but the species was not recorded again until May 15. On May 19 a flock of over 20 arrived but passed on leaving only a few resident in the district.

Bay-breasted Warbler
Dendroica castanea. One male was noted on June 15 deep in the coniferous forest.

Black-polled Warbler
Dendroica striata. A pair was seen on May 20.

Palm Warbler
Dendroica palmarum. A pair was observed May 19 and again on May 20, but not subsequently.

Northern Water-Thrush
Seiurus noveboracensis. The only record was made on May 26.

Wilson's Warbler
Wilsonia pusilla. A few were observed daily between June 11 and 15 in the willow thickets near the shore.

Red-winged Blackbird
Agelaius phoeniceus. Eight arrived on April 30 and several were seen daily from then on.

Rusty Blackbird
Euphagus carolinus. A dozen were noted on May 3 in company with several other blackbirds, and they were present for about a week. Subsequently a few were noted occasionally, but none after May 20.

Bronzed Grackle
Quiscalus quiscula. It was first noted April 29 and several remained in the region close to the settlement. On June 16 a pair was observed nest-building under the eaves of an old log storehouse.

Evening Grosbeak
Hesperiphona vespertina. On February 16, two males were seen and heard eating buds in some low scrub-birch. About a week later, a pair was noted in similar shrubbery nearby. Two males were again seen on April 15 when the ground was still covered with snow.

Pine Siskin
Spinus pinus. Two pairs were seen on June 12, and a slightly larger flock noted on June 16.

White-winged Crossbill
Loxia leucoptera. The beautiful pair which I startled on the ground just ahead of me early on the morning of May 15 is a vivid memory. They were not seen again.

Savannah Sparrow
Passerculus sandwichensis. Four were seen on May 26, and a few for the last time on May 29.

Vesper Sparrow
Pooecetes gramineus. A few were seen in May between the third and eighth but not noted again until May 18. None was observed after May 20.

Slate-coloured Junco
Junco hyemalis. A few were seen in the area during early November. They were not noted again until April 20 when a flock of about ten returned and stayed until the end of May. Thereafter occasional birds were seen.

Tree Sparrow
Spizella arborea. Occasional birds were seen on April 29 and throughout the first two weeks of May only.

Chipping Sparrow
Spizella passerina. Two were first noted on May 18 and subsequently a few pairs could readily be found in the area.

Harris's Sparrow
Zonotrichia querula. Two handsome birds were noted on May 17 in company with White-throated Sparrows, and one was seen the following day, but none subsequently.

White-crowned Sparrow
Zonotrichia leucophrys. Two were observed on May 14, and several on May 17. A few birds were seen during the following week.

White-throated Sparrow
Zonotrichia albicollis. Several of these birds arrived on May 14 with the White-crowns, and large numbers were evident in the following week. Several remained in the district and were seen daily thereafter.

Song Sparrow
Melospiza melodia. These birds were first seen on May 2, and remained throughout the spring and summer.

Lapland Longspur
Calcarius lapponicus. Two females were observed on May 19 and 20, and caused considerable diagnostic difficulty. The birds observed on May 26 were undoubtedly the same species, although the brown nape was now chestnut, and there was some chestnut coloration between the two indistinct wing-bars. The next day, identification was assured by the presence of two fine males in company with the female bird noted the day before. On May 28, 3 males and 4 females were noted in the final record for this species.

Snow Bunting
Plectrophenax nivalis. Large flocks were seen in early November and then the species disappeared until April 9 when a flock of 30 returned. A few were seen in the following 3 weeks, then on April 29 a flock of more than 100 were observed flying southward. Considerable numbers were seen on May 1 and 2, but none thereafter.

It is hoped that these records of 71 species will be of value in augmenting knowledge of the range, migration, and habitat of these species. Several of the birds noted here are original records for myself. Of some interest, perhaps, are those species which I totally missed over the eight-month period. The absence of owls and woodpeckers was outstanding. On only one occasion was there a suggestion of owls in the area; late one spring evening a flock of crows held a very noisy and prolonged conference in the woods near a tall spruce tree. The absence of blue jays and nuthatches made one feel that he had been neglected by two old friends. The only bird seen which was not adequately identified was a large Buteo or Eagle noticed soaring in the distance over an adjacent lake on May 8.

NOTES AND OBSERVATIONS

European Starling Reaches the Pacific Coast. — A specimen of the European Starling, *Sturnus vulgaris vulgaris* Linnaeus, was recently forwarded to the National Museum of Canada, by Dr. J. E. Whiting, Bella Coola, British Columbia, with the request that his correct identification of this specimen be corroborated. This specimen, National Museum of Canada No. 33406, was found dead on the balcony of a building in Bella Coola about December 1, 1948. It is a female and its plumage is that of an adult, not a bird of the year. In condition it was badly emaciated.

Dr. Whiting informs me *(in litt.)* that his brother-in-law, Mr. W. E. Pearce, who became familiar with this species when he resided formerly in southern Ontario, observed two individuals of this starling at Bella Coola, B.C., in March, 1947. He was able to observe these birds carefully and is sure of the correctness of his identification. — W. EARL GODFREY, National Museum of Canada, Ottawa.

A CORRECTION: In spite of the waning use of the comma it is still important. In the brief article "On the distribution of the Golden Eagle in Eastern Canada" (Can. Field-Nat., 63: 39-41), in the last paragraph, the sentence should read,

> " . . . east to northern Ungava, Newfoundland Labrador and Nova Scotia".

The printer inadvertently put a comma after Newfoundland and its was not detected by me in reading proof. Thus this relatively unimportant punctuation mark casts a suspicion of occurrence of an additional species in a whole new Province ! I know of no Newfoundland records for the Golden Eagle *(Aquila chrysaetos canadensis)*. — L. L. SNYDER, Royal Ontario Museum of Zoology.

REVIEW

Fieldbook of Natural History. *By E. Laurence Palmer. Whittlesey House, McGraw-Hill Book Co., Inc. New York and Toronto; pp. 664. 1949. (Trade edition $8.50).*

The amount of information included, by skilful presentation and economical format, in this book is almost unbelievable. Rock, minerals and stars are treated, as well as all living groups of plants and animals. One might feel misgivings about the feasibility of treating so large a field in one volume, but the author has been very successful. In the "more than a decade" of preparing his book Professor Palmer must have been constantly tortured by the necessity of sacrificing good examples to keep within set limits. Although no two people would agree wholly on choice, I feel that almost all selections have been fortunately made. To quote from the preface, "The forms here included . . . . . represent to the author the things that have most interested him, his students, and his friends in more than a third of a century of teaching field natural history . . . . . ." A balanced picture of all the major groups is given, with exotic forms included where it seemed advisable. Thus some tropical food plants are presented; and, among the mammals, many zoological garden favourites are found. Unusual emphasis is given to domestic animals and cultivated plants; e.g., the forty-six grasses treated include all important cereals, and flint, dent, sweet and pop corn are all illustrated.

Treatment is uniform where possible, with three species, or occasionally groups, illustrated at the top of a page and the text below giving description, distribution, life history and economic status. The print is small, but clear type and good paper largely offset this drawback. Most of the illustrations are good. Those of some mammals are perhaps outstanding, but those of the fungi and flowering plants are uniformly clear and accurate. Some of the bird illustrations are not entirely satisfactory in attitude or detail; e.g., the stance of the red-backed sandpiper is atypical and the droop of the bill should be mainly near the tip — an important distinction from the rare curlew sandpiper. Tracks are illustrated for many animals, but those of some birds lack a scale, which reduces their value. Thus the difference in form of track between the two yellow-legs is largely unreal, depending on tracking conditions; but the length of the print, 32-36 mm., in the lesser and 37-46 mm. in the greater, excluding the hind toe, which occasionally registers in either bird, is an almost infallible field mark.

The work seems very free of errors, other than in proper names, some of which are little but quibbles of nomenclature; e.g. the American wood sorrel, *Oxalis montana*, is included with *O. acetosella*. More important is the jumbling of *Hylocereus undatus* into *Heliocereus undulatus*. The reindeer, *Rangifer tarandus*, is inadvertently given as *R. arcticus*, although that epithet is correctly assigned to the barren-ground caribou in the same paragraph. The only serious error noticed is the surprising statement that all mistletoes are American, which is about 50 per cent wrong. Some inconsistencies in common name usage between text and illustrations probably stem from the long period of preparation. Since the book may be widely used by biologists working outside their special field and by teachers with limited professional contacts, its usefulness would be enhanced if the accented syllable of each scientific name were marked.

This volume can be heartily recommended to natural history teachers and to all biologists and naturalists who need a general reference outside their fields of main interest. It will also be useful on trips when few books can be taken. Bird watchers, of course, will not find that it replaces standard works on identification, but will find in it valuable supplementary information. At today's costs the price can hardly be considered high for a book of such quality with some 2,000 illustrations, but teachers should note that a text edition, not sold through normal retail channels, is available at $5.50. — D. B. O. SAVILE.

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The Canadian Field-Naturalist

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NOTES ON THE FAUNA OF THE FORMER NEMISKAM NATIONAL PARK AND VICINITY, ALBERTA[1,2]

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J. Dewey Soper

Dominion Wildlife Service, Edmonton, Alberta.

FOREWORD

THE AREA dealt with in this paper lies in the treeless, semi-arid plains of south-eastern Alberta. The type of environment represented is typical of a wide expanse of territory on the Missouri drainage in Canada extending from approximately Big Muddy Lake, Saskatchewan, west to the foothills of the Rocky Mountains. The faunal aggregate is essentially simple, consisting of relatively few species, but some of these abound in individuals.

In the following pages, the various indigenous species listed are fairly representative of the characteristic shortgrass plains comprising a very large part of southern Alberta. Some members of the regional fauna not detected in the park are known to occur widely in surrounding country. Owing to the period when investigations were conducted, only summer resident birdlife is treated; many additional species are certain to occur during spring and and autumn migrations. In addition, an obvious weakness exists with respect to water birds. Were the park to contain feeding and breeding waters, the ornithological properties of the area would be greatly enriched thereby, as the Great Plains ordinarily possess a marked attraction for ducks and shore-birds in large numbers where suitable sloughs and lakes occur.

Wildlife observations were carried out at Nemiskam National Park only at the height of summer. The more important results were obtained during the latter part of June, 1941. The actual park data are supplemented in the writer's experience by many months of field work, since 1927, in areas of southern Alberta, relatively near by, which possess a practically identical biotic complex.

The area is easily reached by various roads connecting with the Provincial highway system. From the north the west gate is most readily accessible from gravelled Highway No. 3 by driving south from Bow Island on the road to the village of Nemiskam. Alternatively, one may proceed north from Nemiskam on the main secondary road that runs from Stirling to Etzikom, and Manyberries. The facility with which the park can be reached by these routes will be conditioned by the weather, as all immediate approaches are over earth roads which become temporarily useless during heavy rains. Park trails are of the same general nature, but, as they run over virgin sod, do not disintegrate in the same manner as graded earth roads.

My thanks are due to Edwin Matthews, Park Warden, who kindly assisted me in many ways while I was conducting the investigations and afterwards took the trouble to supply by mail certain faunal information that otherwise would not have been obtained. It is also a pleasure to acknowledge the kind assistance of Dr. R. M. Anderson, National Museum of Canada, Ottawa, who sub-specifically determined the small mammals collected in the park. It may be stated, also, that his recent publication, *Catalogue of Canadian Recent Mammals*, 1946, has been followed with respect to the nomenclature and sequence of species of quadrupeds treated in this paper.

With respect to the nomenclature of birds, the American Ornithologists' Union Check-List of North American Birds, Fourth Edition, 1931, has been followed, together with the succeeding Nineteenth to Twenty-second Supplements, inclusive.

[1] This park was cancelled by legislation adopted during the 1946-47 session of Parliament. The present observations were made and the manuscript written prior to the annulment of the park.

[2] Received for publication January 4, 1949.

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PHYSICAL GEOGRAPHY AND CLIMATE

Nemiskam National Park is situated in Alberta about 42 miles southwest of Medicine Hat, 72 miles east-southeast of Lethbridge, and 36 miles north of the International Boundary. Pakowki Lake lies 12 miles southeast, and the nearest point on the South Saskatchewan River is 24 miles to the northwest. The centre of the preserve is at approximately 49°32' 50"N. Lat. and 111°14'W. Long. Geographical details of the district may be found on the Dominion Sectional Map No. 16, known as the Milk River Sheet. The reservation has an area of 8.5 square miles, or 5,440 acres.

The district varies in elevation from about 2,700 to 3,000 feet above sea-level, with the terrain rising gently to the south and west. The high plains sections of the park lie at an elevation of approximately 2,900 feet, while the minimum elevations on the bottomlands of the major coulees vary from 2,750 to 2,700 feet. Everywhere in the park and immediate vicinity the uplands are gently rolling in character. The greater depressions on the plains have been produced in connection with the drainage system and thus the high country becomes increasingly more undulating and rugged as the striking arroyos, lake basins, and river valleys are approached.

The notable coulees which traverse the plains are outstanding characteristics of the territory. The park is intersected by two of these — Chin and Fortymile Coulees. Such terrain presents ideal, rough country for antelope and mule deer, both of which have a liking for considerable variation in the topography. About one-third of the entire park consists of this type of land. The two coulees originate at considerable distances to the west and come together in the northeast corner of the park; to the east of the forks the valley is called Sevenpersons Coulee.

Chin Coulee is the principal depression in the park. It extends diagonally across the area from the southwest corner to the northeast end, dividing the preserve into two sections, the larger percentage of the high plains lying to the west. The portion of this coulee within the park is 3.3 miles long, with an average width of about three-quarters of a mile and a depth of 200 feet (Fig. 1). It constitutes a rather impressive topographical feature. A small creek flows through it to Sevenpersons Coulee, where it is joined by run-off waters from Fortymile Coulee. The greater part of the Chin Coulee bottomlands is gently undulating, arid, and grown more or less sparsely to grasses, greasewood, sagebrush, and cacti. Only the lands bordering the creek are wet; in very narrow zonations they are inclined to be somewhat marshy. A dam was built in the southwest quarter of Section 12, Range 10, above which is an area of pond and marsh covering about 80 or 90 acres (Fig. 1).

The main escarpments and buttes of the area are steep and rugged, forming many sections of well-developed badlands. (Fig. 2). Most of the formation is a greyish-white material, suggestive of a highly compressed sandy clay, here and there exhibiting a local abundance of small fossil shells. This stratum is moderately hard, but it weathers much more rapidly than the dark layers of shale and sandstone which cap it and form sterile outwashes on the declivities below. In a few places very thin seams of soft coal were discerned in association with the shale and sandstone. The latter strata lie about two-thirds of the way up the valley walls from the level of the bottomlands and appear in most places to average between two and three feet in thickness. As the material below disintegrates, these strata assume the character of overhanging cap-rock, which finally breaks off in boulders of varying size to form small masses of talus, while some of the individual pieces roll farther down the slopes. Portions of this rock have a deep rusty colour. Above the sandstone stratum is a deep mantle of glacial clays, which goes to compose the high plains of the surrounding country. The geology of the district is referable to the Foremost Formation, Upper Cretaceous, of the Mesozoic Era.

Another conspicuous topographical feature is Fortymile Coulee. Its park section, running along the northern boundary, is nearly three miles long and averages about a half-mile in width, though in places it expands to nearly a mile. The depth varies from about 150 to 200 feet. On the whole, it is notably different from Chin Coulee, as most of the floor is flat, featureless, and of a somewhat marshy character, especially after floods and heavy spring runoff. At the height of summer it becomes dry, or nearly so, some parts developing into expanses of smooth, hard mud, interlaced with geometric cracks, while other areas are characterized by myriads of small hummocks, or "niggerheads". Generally speaking, the slopes of this valley rise more gently from the bottomlands than do those in Chin Coulee, with a greater accumulation of

Fig. 1. View of Chin Coulee, Nemiskam National Park, Alberta, looking northeast. Junction with Fortymile Coulee to be seen near the horizon. Marshy area above the dam lies in the left middle distance.

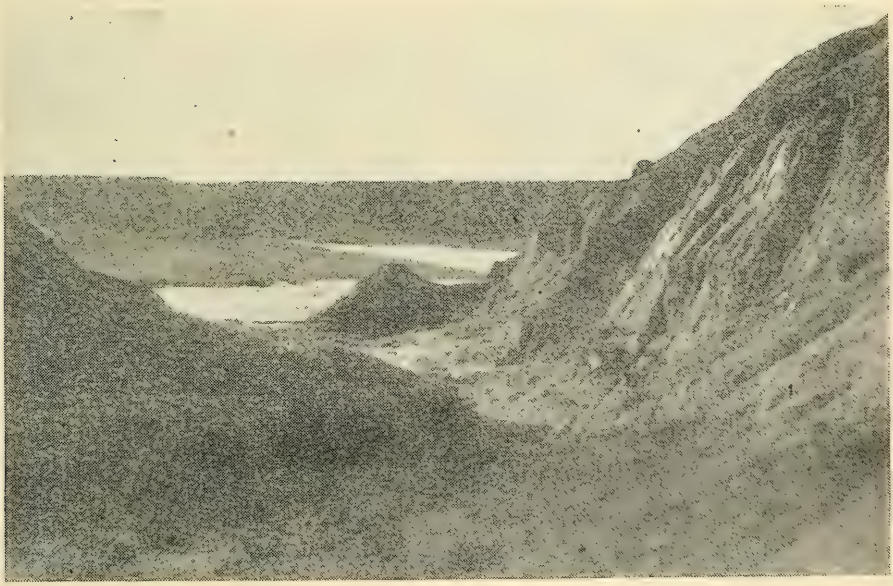

Fig. 2. A rugged, deeply eroded ravine tributary to Chin Coulee near the southern boundary of Nemiskam National Park. The west wall of the coulee is visible in the far distance, with the alkali-sagebrush bottomlands intervening.

detritus; there are practically no bedrock outcrops, or true badlands, and major tributary ravines are few and far between. Numerous minor washes, however, furrow the faces of the slopes. There does not appear to be an active creek in summer, as in Chin Coulee. In past ages both coulees were the scenes of enormous post-glacial drainage which carved out such conspicuous trenches across the face of the plains. Subsequent aqueous and atmospheric erosion has slowly sculptured the slopes into the form observed at the present time.

An artesian well on the floor of Chin Coulee near the south boundary is said to be 500 feet deep. While I was camped there a test was made on the rate of flow, which worked out to approximately 235 gallons an hour, or 5,640 gallons per day. The water gushes from a two-inch pipe into a wooden trough and from there flows into the creek that runs to the small reservoir above the dam. Owing to this supply of water, the marsh area at this point is permanent, although the flow is markedly offset by evaporation. Another artesian well is located at the warden's cabin on the high plain in the southeast corner of the Park (Fig. 4). The flow is similar to the one described above.

The region surrounding the park is very largely devoted to dry farming, although ranching is also carried on in the wilder and more rugged localities. As conditions are semi-arid, partial or total crop failure is not uncommon. This was particularly the case during the many years of acute drought following 1930, when extensive soil drifting was a prevalent feature. During, or even prior to, this period, scores of farms were abandoned. Even in normal times the mean yearly precipitation is only about 12 inches, while the average length of the growing season (number of days from average date of seeding to average date of first frost) is approximately 155 days.

Spring commences in late March or early April, and snow normally disappears by the middle of the latter month, if not earlier. During an occasional early spring, snow completely disappears in the latter part of March and the earliest vernal flowers appear on the plains a few weeks later. The summer is comparatively long, with moderate temperatures, but periods of excessive heat are not uncommon. Such spells may come as early as mid-June, or soon thereafter. During the investigations in 1941 the days were very hot, the temperatures from June 23 to 25 running from 102° to 110°F. during the middle of the day. Temperatures on other days were in the high nineties. Autumn commences in the latter part of September and may be said to last until late October. Snow may arrive in November, but during some seasons it is absent until December, sometimes as late as Christmas. The cold is often intense. However, the winter in this region is frequently modified by chinooks, which occasionally melt all the snow during January or February. At such times conditions are spring-like, but these spells are normally followed by cold water, fresh snowfalls, and persistent winds.

NOTES ON THE FLORA

The region is classified as semi-arid, owing to the scanty precipitation. In consequence the vegetation is highly xerophilous, and similar to that prevailing throughout the Great Plains region of southern Alberta and Saskatchewan, especially on the Missouri River drainage. For the most part the vegetation is thin, and of a desert-like character; this especially applies to the badlands and the floors of the great coulees, where the soil is often poor and excessively dry. In many places the ground is sterile and bare, or sparsely clothed with a mat type of vegetation, while grasses and some other plants may exist only in scattered bunches. On the high, open plains the grasses are more continuous, including the gramma grasses of the genus *Bouteloua*, natural forage for the Pronghorn Antelope.

Highly typical of the region are sagebrush *(Artemisia)*, greasewood *(Sarcobatus)*, the little cushion cactus *(Mammilaria)*, and the prickly pear cactus *(Opuntia)*; the latter blooms profusely during the latter part of June and early July. While these species may occur at various levels up to the high plains, they are more abundant and reach their best development on the coulee bottomlands and adjoining benches. The sagebrush and greasewood frequently cover considerable areas without a break. In Nemiskam Park they usually grow to a height of from eighteen inches to two feet. The best examples are to be found in Chin Coulee. The sagebrush also climbs into the tributary ravines, as well as to ledges of the badlands proper.

Another characteristic shrub is the snowberry *(Symphoricarpos)*, which commonly thrives in scattered clumps in favourable habitats on benches and intermediate slopes and in tributary draws. Thickets of wild rose *(Rosa)* are also well distributed in similar

Fig. 3. Badlands section, showing effects of erosion and accumulation of talus forming the lower slope. Chin Coulee sagebrush flat in the middle distance. Nest of the Ferruginous Rough-legged Hawk is to be seen on a shelf of the acclivity to the left. June 25, 1941.

Fig. 4. Eastern portion of the high plains of Nemiskam National Park as seen from near the southeastern extremity of the area, looking north. Warden cabin, out-buildings and artesian well in the foreground. June 26, 1941.

situations. An unexpected feature was the occurrence of several shrubs usually found only in the humid parts of the Transition Zone; thus, on a few sheltered slopes of washes, or in hollows high up on the east slope of Chin Coulee and on the south slope of Fortymile Coulee, are small, dense thickets composed of chokecherry *(Prunus)*, saskatoon *(Amelanchier)*, silverberry *(Elaeagnus)*, dogwood *(Cornus)*, gooseberry, and black currant *(Ribes)*. In one particularly dense and luxuriant copse of this nature chokecherries and saskatoons had attained a height of from 10 to 12 feet. Only a few such thickets occur in the park, and all are of small extent. Their presence in a semi-arid locality of this nature is probably explained by the fact that they are able to exist in nooks of northern exposure where deep snowbanks form in winter and are comparatively late in melting during the spring; these circumstances would provide much needed moisture and a certain degree of coolness well into late spring or early summer.

An even greater anomaly in the park flora is the presence of two western cottonwoods *(Populus Sargentii?)* in Fortymile Coulee. The trunks are about nine inches in diameter and the taller of the two is approximately 30 feet high. They grow well out on the bottomlands on a small area of well-elevated ground which is continuous with the slope on the south side of the coulee. This is a very surprising occurrence, as ordinarily the only trees found in the entire region are those which have been planted as windbreaks, aside from the woods existing on Cypress Hills and locally along the margins of the larger streams.

FAUNAL LIFE ZONE

The park lies deeply within the western, semi-arid division of the Transition Life Zone. This zoögeographic division is characterized by scanty rainfall, shortgrass treeless plains, and the presence of cacti, sagebrush, greasewood, and other plants of arid regions, together with certain typical mammals and birds. In some aspects of the situation even dilute Upper Sonoran Zone conditions are suggested. This will presently be noted in some detail. On the other hand, there is an interesting departure from 'normal' conditions, as expressed in the presence of such shrubs as chokecherry, saskatoon and dogwood, which are fundamentally characteristic of the more northern, or humid, division of the Transition Zone. Based on these and other features, it is evident that the fauna and flora of the park are more composite in character than one would ordinarily have anticipated, in view of the location.

As already inferred, the life zone chiefly represented is the semi-arid division of the Transition. *Mammals* characteristic of this zone which occur, or did occur, in the park or vicinity are: Long-tailed Weasel, Badger, Kit Fox, Nebraska Coyote, Great Plains Muskrat, Richardson Ground Squirrel, White-tailed Jack Rabbit, Rocky Mountain Mule Deer, and Pronghorn Antelope. *Birds:* Franklin Gull, Swainson and Ferruginous Rough-legged Hawks, Prairie Falcon, Sage Grouse, Magpie, Western Willet, Arkansas Kingbird, Western Meadowlark, Desert Horned Lark, Lark Bunting, Brewer and Vesper Sparrows, and McCown's Longspur. *Shrubs:* silverberry, wild rose, sagebrush, and snowberry, athough all of these species, like some of the mammals and birds which have been mentioned, also occur in parts of the western humid division of the Transition Zone.

Park mammals which are customarily regarded as typical of the Upper Sonoran Zone are Osgood White-footed Mouse, Badland Meadow Mouse, California Porcupine, and Black Hills Cottontail. Birds noted in the preserve which are also normally referred to this zone are: Burrowing Owl, Say's Phoebe, Western Mourning Dove, Lark Sparrow, and Rock Wren. Plants found in the park which are considered principally Upper Sonoran are the greasewood and prickly pear cactus; sagebrush is also highly characteristic of this zone.

That the humid division of the Transition Life Zone is barely represented in very attenuated form is shown by the presence of such shrubs as saskatoon, chokecherry, gooseberry, and black currant, which were previously discussed. Northern Plains Skunk, Richardson Ground Squirrel, and White-tailed Jack Rabbit are common in this zone, though the latter two species are perhaps more typical of, and reach their maximum abundance in, the semi-arid division of the Transition Zone, where they were earlier listed. Birds observed in the park which are commonest in the humid Transition are Eastern Kingbird, Brown Thrasher, and Yellow Warbler; these three species inhabit the few small thickets that find foothold in Chin and Fortymile Coulees.

Many species of western mammals and birds range through two or more life zones. Of the native park mammals, for example, the Long-tailed Weasel, Badger, Richardson Ground Squirrel, and White-tailed Jack Rabbit

range from the humid Transition Zone through the semi-arid division of this zone into the Upper Sonoran Zone. Birds doing the same include Mallard, Pintail, Swainson and Marsh Hawks, Western Willet, Tree Swallow, Magpie, Western Meadowlark, Yellow-headed and Red-winged Blackbirds, Goldfinch, Vesper and Clay-colored Sparrows, and Chestnut-collared Longspur. Other park species, such as Osgood White-footed Mouse, Badland Meadow Vole, Great Plains Muskrat, California Porcupine, Black Hills Cottontail, Pronghorn Antelope, Sage Grouse, Rock Wren, Lark Bunting, Burrowing Owl, McCown Longspur, Sprague Pipit, and Brewer Sparrow, are well distributed in both the semi-arid Transition and Upper Sonoran zones. The classification given in preceding paragraphs, however, shows the zone in which the various species are to be regarded as most characteristic.

PRELIMINARY REMARKS ON THE FAUNA

During the park investigations every effort was made to detect all species of the mammalia which inhabit the area and to secure a representative series of specimens of the smaller species for accurate subspecific determination. To a certain extent results were disappointing, as only two species of mice were secured — Osgoode White-footed Mouse *(Peromyscus maniculatus osgoodi)* and Badland Meadow Mouse *(Microtus pennsylvanicus insperatus)*. There is every reason to believe, on zonal and geographical grounds, that several other of the smaller southern mammals inhabit this locality. From this the conclusion is to be drawn that either the species suspected to occur there are normally very scarce, or that in 1941 they were experiencing a low numerical level in a natural cycle of relative abundance. Some animals, although permanent inhabitants, are not normally very common on the Great Plains. The difficulty of locating some species that are not only regularly characterized by thin dispersal, but are furthermore notoriously local in their distribution, is also a factor.

A naturalist's early impression upon first driving through the park is that birdlife on the whole is not very abundant. This is somewhat modified, however, as attention is gradually directed with more thoroughness to various areas. Among the first species to be noted are Vesper and Clay-colored Sparrows, Lark Bunting, McCown Longspur, and Ferruginous Rough-legged Hawk. The latter are often to be seen soaring overhead or perched on prominent crags of the badlands buttes. Another conspicuous bird, as well as a brilliant singer of arresting quality, is the Western Meadowlark, which inhabits both the high plains and the coulee bottomlands. Horned Larks are also found commonly dispersed in both situations, together with a few widely scattered Chestnut-collared Longspurs.

The commonest birds of the Chin Coulee bottomlands (and to a lesser extent of Forty-mile Coulee) are Red-winged and Brewer Blackbirds, Lark Bunting, Vesper and Savannah Sparrows, McCown Longspur, Horned Lark, and Killdeer Plover. Many Nighthawks are on the wing during the evening. Less numerous are Burrowing Owl, Brewer Sparrow, American Magpie, Arkansas Kingbird, Sharp-tailed Grouse, Swainson Hawk, Prairie Falcon, and Sprague Pipit. The most characteristic species to be found in the lateral ravines and adjacent badlands are Rock Wren, Lark Sparrow, and Say Phoebe. Inhabiting the small thickets of shrubbery were Eastern Kingbird, Brown Thrasher, Crow, Magpie, Goldfinch, Yellow Warbler, and Brewer Blackbird.

Of the waterfowl only a few Mallards, Pintails, and Coots were observed—all at the marshy pond above the dam in Chin Coulee. Were it not for this small reservoir it is quite probable that no ducks would alight in the park, as the creeks are too small to attract them. One Sora Rail was also detected in this marsh. The park list in its present form contains 48 species of birds; this is bound to be expanded when further investigations are carried out at different seasons of the year, particularly during the spring and fall migrations.

ANNOTATED LIST OF MAMMALS

1. Prairie Kit Fox.

Vulpes velox hebes Merriam.—The Kit Fox formerly ranged over the plains of southern Alberta and southwestern Saskatchewan to points in latitude at least 100 miles north of the park. Old residents stated that it formerly occurred in the latter area. No information was secured to indicate that the species exists anywhere in that region at the present time and it may be safely concluded that it has now locally disappeared. In 1927, I was told that a few still occurred in the vicinity of Milk River, south of Cardston, and near Altewan, but nearly all ranchers in the south stated that the species was nearly if not entirely extirpated in most districts. No authenticated records of occurrence have been obtained by me since that time.

2. **Nebraska Coyote.**

Canis latrans nebracensis Merriam.—These animals were seen on several occasions within the park, both in the deep coulees and on the high plains. A short distance east of Chin Coulee one was followed with the motor car for about a mile; it finally disappeared in the direction of Fortymile Coulee. Individuals and small groups were heard howling nearly every night. The species appears to be relatively common. No doubt the protection afforded by the park has permitted the animals to hold their own in the locality; probably it also accounts for the fact that they are not particularly wild and may often be seen travelling about in daylight.

3. **Prairie Long-tailed Weasel.**

Mustela frenata longicauda Bonaparte. — This is a characteristic mammal of the Great Plains which has a wide range across the southern portion of the Prairie Provinces. It occurs at least sparingly in the park, as a male specimen (456, 160, 54 mm.) was collected in Chin Coulee on June 24, 1941. The animal was sighted in mid-forenoon as it ran about in a Richardson Ground Squirrel colony, disappearing first in one burrow and then in another. The ground squirrels in the immediate vicinity vanished down their holes while the weasel furtively ranged from point to point; farther away the squirrels kept up an interchange of excited calls, well aware of an enemy in their midst. This was the only weasel observed in the park. While travelling across the prairies I have many times seen *longicauda* active during daylight hours.

4. **Northern Plains Skunk.**

Mephitis mephitis hudsonica (Richardson). —Nothing was seen of this species in the park, but Warden Matthews informed me that an occasional one was met with in Chin and Fortymile Coulees and in other suitable situations throughout the surrounding country. In 1927, while I was collecting for the National Museum of Canada, ranchers reported the species along Milk River and in the Cypress Hills. In a few localities of the south country the animals were said to be common; they have a wide distribution.

5. **American Badger.**

Taxidea taxus taxus (Schreber).—On June 24 a badger was seen on a greasewood flat near the creek in Chin Coulee, about three-quarters of a mile southwest of the dam. It was then actively engaged in digging, and disappeared as the hole was approached. The animal may have been burrowing for Richardson Ground Squirrels, which were plentiful in the locality. Old and fresh badger diggings were seen in several places along the bottomlands of Chin Coulee, and another was noted on the high plains a short distance to the east. It appeared that at least two or three pairs of the animals inhabited the park. The species is widely distributed on the southern plains of the province.

6. **White-tailed Jack Rabbit.**

Lepus townsendii campanius Hollister. — This hare was observed on many occasions, both in the main valleys and on the upper shortgrass plains. However, it could not be regarded as particularly common. Warden Matthews stated a few years previously the animals were very scarce, but that a distinct increase in numbers had taken place in 1940 and 1941. This agrees with an upward trend in the cycle of relative abundance which has been noted over wide areas of the Prairie Provinces during the same period; it also coincides with an increase in the Varying Hare (*L. a. americanus*) population in the wooded sections of the West.

7. **Black Hills Cottontail.**

Sylvilagus nuttallii grangeri (Allen). — These rabbits were found fairly common in brushy ravines on the east side of Chin Coulee. They live in patches of wild rose, snowberry, and sagebrush in the lower reaches of the tributary coulees, under boulders, and in crevices which have developed in the walls of the badlands buttes. They were flushed on many occasions during the day when the badlands were being explored. Occasionally they were to be seen sitting in open view on lower ledges of the buttes, but more often they were hiding in holes, or in burrows in the slopes, or in scrubby thickets on the ravine bottoms and lower slopes. Two adults and two juveniles were collected, as follows: Adults: ♀, 405,66, 100, weight 3¼ lbs: ♀, 429,69,100, 3 1/3 lbs. Juveniles: 235,36,57, 9 ozs; and 238,37,58 mm., 9 ozs. At this time the young were about half-grown and capable of running through the badlands at a speed almost equal to that of the adults. At no time were the animals seen at the higher elevations, nor on the more or less open lower benches and bottomlands of the main coulees.

8. **Richardson Ground Squirrel.**

Citellus richardsonii richardsonii (Sabine). —This ground squirrel inhabits the park in considerable numbers. It is locally abundant on the sagebrush and greasewood bottomlands of Chin Coulee and in suitable situations on the margins of the flats in Fortymile Coulee. For the most part the latter is too low for successful occupation, as during the spring runoff and after heavy rains the lands become wet and boggy. In Chin Coulee the animals form distinct colonies in several places, although they are also generally dispersed. While they occupy the lower benches and lateral coulees, or ravines, they are not as common there as on the slightly undulating bottomlands on both sides of the creek. The species occurs in some numbers on the high plains, but there it is more thinly represented; no distinct colonies were noted, as on the coulee lowlands. This is one of the commonest and certainly the most conspicuous of the park mammals.

9. **Osgood White-footed Mouse.**

Peromyscus maniculatus osgoodi Mearns. At the time of investigations this pale-coloured race was common and almost universally distributed. It haunts practically every type of environment in the park. Thus, traps yielded specimens on the high, shortgrass plains; in the rocky ravines; in the badlands flanking the coulees; in the brushy tracts on the valley slopes; on the sagebrush and greasewood flats of the main coulees; and along the creek. However, they vary in numbers from place to place. They were most abundant in the brushy and rocky lateral ravines and in the badlands sections of the coulee walls, where rock outcrops, scattered boulders, and clumps of sagebrush and wild rose afforded cover and protection. Many were also taken in small thickets of chokecherry, saskatoon, and snowberry sparingly scattered on the east slope of Chin Coulee and on the south side of Fortymile Coulee. Under one set of conditions chiefly in the sagebrush and greasewood flats of Chin Coulee and the first benchlands immediately above, 23 white-footed mice were collected in 90 trap-nights. From 75 to 100 feet above the floor of the coulee, in the rocky and brushy lateral ravines and in thickets on the main slope of the valley, 44 of the animals were secured in the same number of trap-nights. A good proportion of these were taken in the thickets of wild rose, chokecherry, etc., mentioned above. A small series of specimens was preserved, as follows: ♂, 160, 64,20; ♂,162,63,20; ♂164,68,19.5; and ♀, 162, 65, 20 mm.

10. **Saskatchewan Jumping Mouse.**

Zapus princeps minor Preble. — In 1941 Warden Matthews and his son stated that jumping mice occurred sparingly on the high plains in the park and vicinity. Examples had been seen in former years while cutting hay in damp depressions. Writing to me in August, 1943, Warden Matthews remarked: "I have now established beyond doubt that jumping mice occur in this locality. We were ploughing fireguards along the west side of the park when one jumped from under the ploughing and hopped away so quickly we could not stop the tractor in time to secure it before escaping into a pile of dry thistles". There is very little information about the genus *Zapus* on the shortgrass plains of Alberta, owing to lack of specimens. Since this is the only form known to occur there, it is assumed to be *Z. p. minor* that inhabits the park district. Specimens which I secured in 1927 at Lodge Creek, south of Cypress Hills, are referable to that subspecies.

11. **Badland Meadow Vole.**

Microtus pennsylvanicus insperatus (Allen).—This Great Plains subspecies occurs sparingly in suitable habitats. The majority inhabit damp places along the creek and the small marsh area above the dam in Chin Coulee. A few were also found in wild rose and snowberry tracts in the lower parts of the tributary draws along the east side of the coulee; conditions there were dry, with no surface moisture of any kind. After the spring freshets and during rains, however, the small occupied areas would become temporarily saturated. At the time of investigations the ground was very dry. No *insperatus* was taken at the higher elevations on slopes in ravines, or on the high plains. Out of a total of 180 trap-nights only five specimens were secured. Three of these were preserved, as follows: ♂, 174,49,21; ♂, 174,48,19.5; and ♀, 144,34,19 mm. In general characters, one of these shows some approach to *M. p. drummondii,* with which it intergrades on the perimeter of the shortgrass, semi-arid plains to the north and east, and in Cypress Hills. This race is sometimes referred to as the Bean Mouse, as farther south, at least, it lays up large stores of the underground beans of *Falcata comosa* and the tuber of wild artichoke, *Helianthus tuberosus.*

12. **Great Plains Muskrat.**

Ondatra zibethica cinnamomina (Hollister). Muskrats were not personally observed in the park. Warden Matthews informed me, however, that a few inhabit the creek flowing through Chin Coulee and the small marsh area above the dam. They were not found in any other part of the area for want of suitable environment. In 1927 I found *cinnamomina* along Milk River and collected several specimens at Lodge Creek, Alberta, south of Cypress Hills. The animals were also reported in the Eagle Butte locality, at the west end of the hills. They occur locally throughout the semi-arid portion of southern Alberta.

13. **California Porcupine.**

Erethizon dorsatum epixanthum Brandt.—I did not find this animal in the park or immediate vicinity, but Warden Matthews and his son stated that one occasionally wandered into Chin Coulee. It would thus appear that an occasional one reaches this locality from the Milk River drainage, probably by way of Verdigris and Etzikom Coulees and possibly also from the southeast via Lost River and the Pakowki Lake lowlands. Though I have never noted this animal on the high, shortgrass plains, it no doubt travels over these at times from one coulee or river drainage to another. In 1927 I found the species fairly common along Milk River and at Lodge and North Fork Creeks, Alberta (south of Cypress Hills), where specimens were taken. It was also reported in Medicine Lodge Coulee and at Eagle Butte, which are about 34 miles east of Nemiskam Park.

14. **Rocky Mountain Mule Deer.**

Odocoileus hemionus hemionus (Rafinesque).—On June 24, 1941, an adult female was observed in a badlands draw on the east side of Chin Coulee. On the following day two adults, with four fawns, were seen in the distance on the high and open shortgrass plains about a half-mile to the northeast. Upon observing my approach they fled to the north and disappeared in a ravine at the junction of Chin and Fortymile Coulees, near the eastern boundary of the preserve. These were the only animals actually sighted, but their tracks were noted on many occasions in various sections of the park.

Since I covered nearly the whole area and on two occasions the greater part of it in a single day, seeing but three adults, it is questionable if more than three or four pairs inhabit the park. No bucks were observed. Since the sexes are separated during the summer, it would appear that the males had withdrawn to other parts. If this was the case, it is clear that the animals are capable of leaping over the fence which surrounds the park. During the winter, when snow is banked in places along the fence (especially in ravines), goings and comings are probably accomplished with ease. If breeding takes place in the park it is obvious, however, that the bucks leap the fence during the fall before snowbanks are present. These remarks are of course made with the assumption that the bucks are absent from the park in the summer, as my observations tend to suggest.

15. **American Pronghorn Antelope.**

Antilocapra americana americana (Ord.)—Special attention was given to the observation of this animal in the park, since the area was reserved and fenced for the express purpose of preserving the species. It may be mentioned here that during 1914 the rapid decline in the numbers of antelope in Canada was brought to the attention of the Dominion Government. Necessary action was then taken to establish areas for their permanent protection. Among these was Nemiskam Park (land reserved in 1915; established as a national park in 1922) where the main work in antelope conservation has been carried out. The original herd of this area numbered 42 head; they were secured through the simple method of building a fence around them, enclosing several square miles of terrain. Following these original efforts for the conservation of the Alberta antelope, additional protection was given under Provincial law over the region at large; this finally led to a greatly increased antelope population with the result that in recent years a short, open fall season has been in effect for hunting the animals in certain parts of the country, including southwestern Saskatchewan. It will thus be seen that complete protection for these animals over a long period following the year 1914 worked miracles in saving this unique mammal from extinction.

The park area provides an excellent antelope environment with ample water supply and the shortgrass habitat of rolling plains, interspersed with coulees and badlands, dear to the heart of the pronghorn. Since the rehabilitation of the species proved a success both within and outside of the park, it is

of these animals in the park as a serious responsibility. Consequently the antelope population of the enclosure is now confined to a relatively small representative herd. Here the traveller may see examples of an unusual species that is gifted with grace of outline and amazing powers of speed.

16. **Plains Bison.**

Bison bison bison (Linnaeus).—In earlier times these animals roamed the plains of southern Alberta in remarkable abundance. Signs of former occupation in the park territory and vicinity are still to be seen in such features as old, dimming trails and wallows and rare remnants of body bones and skulls. Within a few years even these will have disappeared as reminders of a once proud species now totally extirpated in the wild state from the Great Plains. Apparently the last of the animals were killed in this region about the year 1883.

ANNOTATED LIST OF BIRDS

1. **Common Mallard.**

Anas platyrhynchos Linnaeus. — A few were seen each time that the small reservoir was visited during the park investigations. It is quite probable that two or three pairs nest in the vicinity of this marsh. Were it not for the creation of the area through the building of the dam on Chin Creek, no waterfowl would be found in the park, as the creeks are too small to be of any particular attraction or usefulness.

2. **American Pintail.**

Dafila acuta Linnaeus.—Several were seen in the marshy pond above the dam, in Chin Coulee, on June 24 and 25, 1941. The same general remarks apply here as under the preceding species.

3. **Swainson Hawk.**

Buteo swainsoni Bonaparte. — An occasional example was observed in the lower length of Chin Coulee and in Fortymile Coulee. On June 25, a pair was found nesting in a western cottonwood in the latter valley; the nest was located about 14 feet from the ground and contained two downy young, just hatched, and an egg from which the juvenile was on the point of emerging. Another pair had a nest in a thicket of chokecherry and saskatoon bushes on the east slope of Chin Coulee about eight feet above the ground; it contained three eggs on June 26. It is believed that only two pairs of these hawks were breeding in the park. The species, as a whole, is far from common in the district.

4. **Ferruginous Rough-legged Hawk.**

Buteo regalis Gray. — This is the common hawk of the park and deeply eroded valleys of the surrounding country. Possibly four or five pairs breed in the preserve, where they normally build their nests on prominent ledges and spurs of the badland buttes. While one is travelling along the great coulees, or on the adjacent high plains, a pair or two are usually to be seen soaring around at a height of several hundred feet. When nests are approached the birds become greatly agitated and give voice to almost continuous loud screams. Several nests were seen within the park boundaries. One was located at the mouth of the rugged draw up which the road grade ascends on the west side of Chin Coulee to the high plain above. It was built on a narrow ledge of a butte about 30 feet up (Fig. 3); the slope was scaled on June 26, when two downy juveniles which were evidently only three or four days old, were found. The nest contained fresh remains of Richardson Ground Squirrels, upon which the young hawks were being fed.

5. **Marsh Hawk.**

Circus cyaneus (Linnaeus). — One was noted in late June, 1941, slowly flying along the creek above the dam in Chin Coulee. No others were observed. The species is also uncommon in the surrounding territory, though in some parts of the south country it is more frequently encountered along the roads than any other hawk.

6. **Prairie Falcon.**

Falco mexicanus Schlegel. — One or two of these falcons were seen daily in the park. Doubtless at least one pair bred somewhere in the local badlands, but a nest was not discovered. The birds were seen chiefly in Chin Coulee, although one was noted in Fortymile Coulee and another was seen flying over the high plain near the eastern boundary of the park. Others were noted in adjacent territory.

7. **Sharp-tailed Grouse.**

Pedioecetes phasianellus (Linnaeus). — These birds were apparently uncommon in the park, as only two were seen during the investigations. One of these was flushed on

a grassy bench in Chin Coulee and the other on the upper plains to the east. Over the West, as a whole, the species showed a distinct increase in numbers, during 1941, as compared with previous seasons. Warden Matthews informed me that flocks were sometimes seen on the upper plains section of park and vicinity, particularly during the autumn.

8. **Sage Hen.**

Centrocercus urophasianus (Bonaparte). — This species was not seen in the park or vicinity, although it is fairly common in some localities in southeastern Alberta and farther east on the Missouri watershed in Saskatchewan. Warden Matthews informed me that rarely one of these birds is to be found on the sagebrush flats of Chin, Fortymile and Etzikom Coulees. They are more numerous in the southeastern part of the province and adjacent parts of Saskatchewan.

9. **European Partridge.**

Perdix perdix (Linnaeus). — I did not observe this species in the area, but Warden Matthews stated that it occasionally occurred there, as well as in the surrounding country. Of late years the birds have been rather scarce throughout the region, but an increase in the population was noticeable in the summer of 1941. After a rise in population for several years the birds were again scarce in 1946.

10. **Sora Rail.**

Porzana carolina (Linnaeus). — On June 24 and 25 one of these rails was heard in the small marshlands above the dam in Chin Coulee. It is assumed that a pair had taken up quarters there for the season and was breeding, as the environment is favourable in all respects for this purpose.

11. **American Coot.**

Fulica americana Gmelin. — A single individual was seen on each of two visits to the pond above the dam in Chin Coulee on June 25 and 26, 1941. It seems highly probable that a pair was nesting there at that time, since conditions were suitable and the bird or birds observed appeared to be established for the season. This is the only place in the park where the species could take up quarters; it is very scarce in the surrounding territory, where there is a dearth of suitable sloughs and where even some of the lakes, such as Pakowki Lake, continue dry.

12. **Killdeer Plover.**

Charadrius vociferus Linnaeus. — These plovers were common, or fairly common, in Chin Coulee, where they resorted to the wet ground at the artesian well, the borders of the creek, and the marshlands at and above the dam. Theirs were among the familiar bird voices of this great valley. A few others were noted in Fortymile Coulee and a pair was also present at the boggy tract fed by the artesian well on the high plain in the southeastern part of the park. They were undoubtedly nesting in the preserve. The species is well represented in suitable places throughout southern Alberta.

13. **Willet.**

Catoptrophorus semipalmatus (Gmelin). Only one Willet was observed during the park investigations. This one was encountered near the dam in Chin Coulee. In the light of subsequent observations, when the area was many times traversed, it would appear that this solitary example was merely a wanderer from some point on the surrounding plains and that the species does not breed in the preserve.

14. **Franklin Gull.**

Larus pipixcan Wagler. — This bird is only an accidental visitor in the park. During the entire stay it was only twice recorded, when a pair flew over Chin Coulee on June 25, and when a solitary example was seen the following day. I know of no place in this region where the species nests.

15. **Mourning Dove.**

Zenaidura macroura (Linnaeus). — This species is apparently of rather rare occurrence, as only one was detected during the investigations. This individual flew out of a chokecherry-saskatoon thicket on the east slope of Chin Coulee on June 26. Though the spot was visited several times later over a period of three days the bird was not seen again.

16. **Burrowing Owl.**

Speotyto cunicularia (Molina). — Two individuals were observed in Chin Coulee during the time spent in the preserve. It is highly probable that the species nests there. Three others were seen in the surrounding country, but in the region as a whole the birds are definitely uncommon. Sometimes long distances can be covered in southern

Alberta and Saskatchewan without observing any, though this is typical Burrowing Owl territory.

17. **Short-eared Owl.**

Asio flammeus (Pontoppidan). — In the early evening of June 25 one of these owls was seen flying slowly over the greasewood flats of Chin Coulee just west of the marsh area, where it was probably searching for white-footed mice or small birds. A peculiarity noted on this occasion was the hovering flight of the bird, which would silently flap its wings over one spot for about five seconds, then proceed to another location 25 to 50 yards away and repeat the performance. Once it was seen to light on the ground among greasewood and sagebrush, where it evidently picked up a mouse. In some localities the species is fairly common. On June 27, 1941, while travelling west and north to Taber, I noted six of these birds in one district within a distance of 10 or 15 miles.

18. **Nighthawk.**

Chordeiles minor (Forster). — Nighthawks were regularly observed each evening over the Chin Coulee badlands, where their familiar calls carried through the silence when other birds, with the exception of an occasional Vesper Sparrow, had ceased to sing. Owing to the regularity with which numbers of these birds were seen daily, there can be no doubt that many pairs nest in the badlands of the park.

19. **Yellow-shafted Flicker.**

Colaptes auratus (Linnaeus). — An unexpected ornithological feature was the occurrence of one of these birds in the park on the day of my arrival. This individual was seen near the west grade leading down into Chin Coulee. The species was not again encountered in the preserve. In the treeless regions these birds are seldom seen, though they habitually feed upon the ground.

20. **Eastern Kingbird.**

Tyrannus tyrannus (Linnaeus). — These birds were locally present in the park, where they inhabited copses of silverberry, saskatoon, dogwood and chokecherry; these grow at wide intervals on the east slope of Chin Coulee and the south slope of Fortymile Coulee. In the former locality a nest which contained four fledglings two or three days old was found on June 25 in a saskatoon bush four feet from the ground. The species was not ordinarily present in places were thickets were absent.

21. **Arkansas Kingbird.**

Tyrannus verticalis Say. — Only one pair of these kingbirds was seen in the park; the birds were nesting in a western cottonwood a short distance up Fortymile Coulee, the nest being located on the lowest limb, near the trunk, about six feet from the ground; on June 25 it contained three eggs. In the adjoining cottonwood, a few feet to the north, was the nest of a pair of Swainson Hawks which was previously mentioned. The kingbirds evidently had no fear whatever of their raptorial neighbours.

22. **Say Phoebe.**

Sayornis saya (Bonaparte). — This is a typical bird of the badlands and is well distributed in the tributary ravines leading to Chin Coulee. However, it appeared to inhabit only those valleys in which erosion had created vertical sections, or small cliffs, preferably with protruding caprock. In one of the latter situations a nest was discovered on June 25; it contained four downy juveniles about a week old. In spite of the heat, the parent birds, uttering their plaintive notes, continued to make frequent visits to the nest.

23. **Horned Lark.**

Eremophila alpestris (Linnaeus). — Horned Larks were common throughout the area, both on the high plains and in the great coulees. Immatures of the year were awing in considerable numbers at the time of the park investigations. The race represented here is apparently the Desert Horned Lark, *E. a. leucolaema.*

24. **Tree Swallow.**

Iridoprocne bicolor (Vieillot). — Three only were seen in the park, flying across Chin Coulee. It is scarcely likely that these birds breed in the area.

25. **Barn Swallow.**

Hirundo rustica Linnaeus. — A single example was observed flying westward near the junction of Chin and Fortymile Coulees. Doubtless this species nests more or less commonly throughout the region in farm and ranch buildings. It is not known to nest in the park.

26. **Cliff Swallow.**

Petrochelidon pyrrhonota (Vieillot). — While not actually observed in the park, it is

no longer necessary to regard the propagation known to breed here occasionally, at least, as old nests were seen on the side of a steep butte in a section of badlands bordering Chin Coulee. From observations made in the summer of 1941 it would appear that the birds do not nest there every year.

27. **American Magpie.**

Pica pica (Linnaeus). — Several were observed each day during the period of park observations, chiefly in and about Chin Coulee, although others were seen inhabiting thickets on the south side of Fortymile Coulee. No evidence of nesting was found, but it seems practically certain that a few pairs breed in the park. The birds ordinarily appeared to haunt only the badlands, as none was noted on the open, upper plains.

28. **Common Crow.**

Corvus brachyrhynchos Brehm. — This species is uncommon in the park area, although a few individuals were to be seen each day in about the same numbers as the magpie. It is not known to nest there, but a few pairs may do so in some of the clumps of shrubbery which occur on slopes and in the ravines. Nests were searched for without result.

29. **Rock Wren.**

Salpinctes obsoletus (Say) — The Rock Wren, like the Say Phoebe, is highly typical of the dry, southern coulees with their badlands formations and scattered sagebrush. The birds were commonly distributed in the more rugged gulches and washes tributary to Chin Coulee, especially on the east side. One was noted in a barren gully on the south side of Fortymile Coulee, but the species does not appear to be as well distributed there as in the former section of the park. The birds certainly nest in suitable situations throughout the area. On several occasions individuals were noted darting into crevices in the buttes, where their nests were undoubtedly located, though they were too far in to be seen.

30. **Brown Thrasher.**

Toxostoma rufum (Linnaeus).—A pair was seen on June 26 in a patch of shrubbery on the south slope of Fortymile Coulee. They were unquestionably nesting in that section. As these were the only examples observed in the park, it is obvious that the species is uncommon.

31. **Mountain Bluebird.**

Sialia currucoides (Bechstein). — On June 23 a pair was observed on the plain near the west gate of the park. The species was not again noted in this locality, but it was several times encountered while I was travelling west and north to Taber and Brooks.

32. **Sprague Pipit.**

Anthus spragueii (Audubon). — One was heard singing at a height of several hundred feet over the high plain east of Chin Coulee on June 25. As this was the only one heard or seen during the investigations, the species may be regarded as of only casual occurrence in the district. It was only rarely noted while crossing the Great Plains to the southeast and east. In view of the time of year when the above individual was detected, it is likely that at least one pair nests in the park.

33. **Yellow Warbler.**

Dendroica petechia (Linnaeus). — Moderately common in the scattered thickets of chokecherry, saskatoon, and silverberry which grow locally on the slopes of Chin and Fortymile Coulees. It was the only warbler detected in the park. Although no nests were found, there can be no doubt as to the breeding of the species in this area. At the time of late June investigations the males were still singing vigorously.

34. **Western Meadowlark.**

Sturnella neglecta Audubon. — This brilliant singer of the western plains is a fairly common inhabitant of the park, frequenting the high shortgrass plains as well as the sagebrush and greasewood flats of Chin and Fortymile Coulees. It was seen in practically all parts of the preserve, but is less common in the badlands areas than on the upper plains. On the whole, the species is scarcer on the arid southern plains than farther north, in the central parts of the province. The birds continue in full song until well into July or even early August. While no nest was found, it is clear that the birds breed in the area.

35. **Yellow-headed Blackbird.**

Xanthocephalus xanthocephalus (Bonaparte).—Several were seen each time the small marsh above the dam in Chin Coulee was visited. It is assumed that at least two or three pairs were nesting there. The birds were not encountered in any other part of the park.

36. Red-winged Blackbird.

Agelaius phoeniceus (Linnaeus). — Examples of this species were common along the creek and in the marshlands above the dam in Chin Coulee, where they were nesting. A few were also seen in Fortymile Coulee and at the boggy tract near the artesian well on the high plain in the southeastern part of the park. Contrary to popular belief, these birds do not require water at their nesting sites. In the semi-arid south nests have many times been found in low thickets of wild rose where no surface water exists.

37. Brewer Blackbird.

Euphagus cyanocephalus (Wagler). — These blackbirds were also common in the preserve, occurring chiefly in Chin Coulee and tributary arroyos, where they were nesting. The creek and pond above the dam were marked attractions, as they came there regularly to drink, in common with many other species. A few were also noted in shrub-grown draws on the south side of Fortymile Coulee and on the high plains, but, as previously mentioned, they were more abundant in Chin Coulee.

38. Goldfinch.

Spinus tristis (Linnaeus).—A solitary goldfinch was seen flying over Chin Coulee on June 24. No others were recorded while working in the district.

39. Spotted Towhee.

Pipilo maculatus Swainson.—This bird was not actually sighted in the park, but one was unmistakably heard singing in a brushy draw on the south side of Fortymile Coulee on June 26. An effort was made to bring the individual into view, but all tactics were unsuccessful. It is quite apparent that the species is very scarce in this area, though on some parts of the Missouri watershed it is quite common in brushy ravines opening into arid coulees.

40. Lark Bunting.

Calamospiza melanocorys Stejneger.—This species is common on the sagebrush and greasewood flats in Chin Coulee and to a lesser extent in Fortymile Coulee, where it undoubtedly breeds. The birds also inhabit the high plains, but in the park territory they are definitely less numerous than on the bottomlands. The males were still singing in full force when the late June observations were made. In parts of southeastern Alberta the species is abundant, both in bottomlands areas and on the upper plains.

41. Savannah Sparrow.

Passerculus sandwichensis (Gmelin). — *Sandwichensis* occurs sparingly along the creek and about the bog area in Chin Coulee, where doubtless a few pairs nest. Two were noted on the swampy ground near the artesian well in the southeastern part of the park. The males were still singing their nuptial songs at this period. On the whole the species may be classed as scarce in the area under review.

42. Baird Sparrow.

Ammodramus bairdii (Audubon). — This is another species which is rare in Nemiskam Park. Throughout the investigations only one was noted, when a singing male was heard on the high plain east of Chin Coulee on June 25. A few were seen in southwestern Saskatchewan and southeastern Alberta while I was en route to the park, but they were found commoner to the north.

43. Vesper Sparrow.

Pooecetes gramineus (Gmelin). — Vesper Sparrows are among the more plentiful and familiar birds of Nemiskam Park. They occur nearly everywhere in the area, being about as numerous in the great coulees and tributary arroyos as on the shortgrass plains above; they breed throughout the region.

44. Lark Sparrow.

Chondestes grammacus (Say).—While I was travelling about the open country in the park very few of these interesting birds were observed. Until the second day in the area it appeared that they were scarce. However, upon my exploring the badlands and tributary draws of Chin Coulee, the birds proved to be much more numerous than at first supposed. They seem to prefer the rugged terrain of badland draws, with their sparse covering of grasses and clumps of rose bushes and sagebrush, where they breed. In such places the birds were fairly common. An occasional individual was encountered in the broader sagebrush and greasewood flats of Chin Coulee and also on the flanks of Fortymile Coulee. The males continue to sing lustily until the early part of July, their sparkling, melodious trills being among the sweetest of voices to be heard in the badlands.

45. Clay-colored Sparrow.

Spizella pallida (Swainson).—Birds of this species were noted in only moderate numbers, but they were found scattered about in most

sections on both the high plains and the lands embraced by the coulees and badlands. Probably owing to the dearth of shrubbery in the upper, shortgrass country, the birds are more often seen in the stands of wild rose, snowberry, and sagebrush which grow more or less plentifully in the coulees. While no nest was discovered, there can be no doubt that these sparrows nest in favourable situations throughout the preserve. The hoarse, monotonous song of this species was often heard on the greasewood and sagebrush flats of Chin Coulee.

46. **Brewer Sparrow.**

Spizella breweri Cassin.—This species is uncommon in the park, but it was noted several times on the open greasewood and sagebrush flats of Chin Coulee above the dam. The birds were observed in no other area within the preserve. This species, after the song season ends, might easily be overlooked among Clay-colored Sparrows. However, the songs are very different; the latter's is composed of rasping notes like *zee-zee-zee-zee*, while that of Brewer Sparrow consists of musical, buzzy trills on different pitches; although these are low in volume and, in a wind, almost inaudible, the notes are quite distinctive. At least three males were heard singing in Chin Coulee and it is presumed that they were breeding in the vicinity.

47. **McCown Longspur.**

Rhynchophanes mccownii (Lawrence).—These longspurs are among the most characteristic of the Nemiskam Park birds. They occur in moderate abundance on the high plains east and west of Chin Coulee, in the bottomlands of the latter, and on immediately adjacent shortgrass benches. A few were also noted in Fortymile Coulee. It is quite evident that considerable numbers breed in the park. At the time of investigations the males were still giving voice to their delightful flight songs. On a still morning, in some parts of the plains where the birds were plentiful, their tinkling, warbling melodies were often commingled with a peculiarly wild and captivating effect. In numerous districts of southern Alberta they are very abundant during the breeding season.

48. **Chestnut-collared Longspur.**

Calcarius ornatus (Townsend).—While occurring in the park, it is scarce in comparison with the number of McCown Longspurs which inhabit the area. My records show that only five or six birds in all were seen there, most of which were singing males. According to my observations, this species is not common anywhere in southern Alberta, but it surpasses the McCown Longspur in abundance in southern Saskatchewan east of Val Marie. Undoubtedly a few of the present species nest within the park, where they favour the high plains more than the coulee lowlands.

NOTES ON REPTILES

1. **Plains Garter Snake.**

Thamnophis radix (Baird and Girard).—Several garter snakes, believed to be referable to this species, were encountered in Chin Coulee and tributary ravines. They are reported to be more or less common throughout the region.

2. **Bull Snake.**

Pituophis sayi sayi (Schlegel).—Bull, or Gopher Snakes were reported as not uncommon in this district. I saw only one in the park; this individual was discovered on the high plains east of Chin Coulee. With some little difficulty it was measured alive, the approximate length being six feet two inches. Rattlesnakes were anticipated in the badlands section of the park, but none was seen; I was subsequently informed that the species was not known to occur there, but many examples have been seen in the Manyberries district and south. There seems to be a belief among plainsmen that the Bull Snake and the Rattlesnake do not occupy the same range.

3. **Hernandez Horned Lizard.**

Phrynosoma douglassi hernandesi Girard. Numbers of these lizards inhabit the coulees in the park. One was found on the badlands on the east side of Chin Coulee near the southern boundary of the preserve. Warden Matthews informed me that he had many times observed them in this tract. They also range in widely scattered coulees of southern Alberta and along the Milk River Valley and tributary drainage areas.

WATERFOWL OF THE FORESTED PORTIONS OF THE CANADIAN PRE-CAMBRIAN SHIELD AND THE PALAEOZOIC BASIN [1]

HAROLD C. HANSON [2], MURRAY ROGERS [3] and EDWARD S. ROGERS [4]

IN RECENT YEARS there has been considerable speculation as to the numbers of game ducks[5] produced on the Pre-Cambrian Shield of Canada, particularly in the forested sections, fig. 1. Some investigators, although recognizing that the optimum density of nesting game ducks in the above region is low, have claimed that because of the vastness of the area involved, considerable numbers are produced in the aggregate. Other workers have said that despite the enormous area involved the total numbers of game ducks produced would be negligible in proportion to the numbers reared in other types of country i.e., the prairies and park lands. The productivity of the Palaeozoic Basin, that great muskeg-covered plain lying adjacent to the west and south coasts of Hudson and James bays, has been of an equally speculative nature. In view of the recent duck decline, it is timely that the productivity of the Pre-Cambrian Shield, as well as the Palaeozoic Basin, be re-evaluated.

The following discussions are based on field studies by the authors in 1946, 1947, and 1948 and a survey of the literature. Hanson made his observations in the muskeg covered plain west of James Bay in the summers of 1946 and 1947 in conjunction with a study of the Canada geese nesting in that area. Murray and Edward Rogers made their observations in the summers of 1947 and 1948 while carrying out an archaeological investigation in the Pre-Cambrian Shield country lying east of James Bay.

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ROUTES TRAVELLED

Leaving from the village of Pagwa River in 1947, Hanson reached Ft. Albany on James Bay via the Pagwa, Kenogami and Albany rivers. At the juncture of the Kenogami and Albany rivers, the Albany was ascended to Ogoki, a distance of about 82 miles. The Albany River was then descended to its mouth, fig. 2, but en route to Ft. Albany, the Pagashi River was investigated for a distance of about 15 miles.

Murray and Edward Rogers began their 1947 canoe journey from Oskelaneo, Quebec, on the old transcontinental C.N.R. line and reached Rupert House at the southeast end of James Bay by the following waterways: Oskelaneo River, Gouin Reservoir, Lake Dubois, Pike Pond, Ventadour River, lakes Gabriel, Nemenjish, Obatogamau, Chibougamau, Dore, LeMoyne, Wakonichi, Mistassini, Albanel and the Rupert River. A portion of the Temiscamie River was also investigated, fig. 2.

The route taken by the Rogers' in 1948 differed from the 1947 route as follows: the Tournemine River, a tributary of the Temiscamie, was ascended; instead of crossing Lake Mistassini to the mouth of the Rupert River, the inward route from Long Portage (connecting Lake Albanel to Mistassini) south to Lake Obatogamau was retraced; between Lake Obatogamau and Lake Dubois, a more easterly route, through lakes Jourdain and Ducharme, Scatsi River and lakes Potrincourt, Buade and Normandin was followed.

The latitudes of the rivers and lakes surveyed in the Palaeozoic Basin and the Pre-Cambrian Shield are approximately the same and the climatic conditions are at least roughly comparable.

GEOLOGY, TOPOGRAPHY and VEGETATION

The canoe routes described above are through two quite different types of country. The Pagwa, Kenogami and Albany River route[6] traverses the Palaeozoic Basin, an immense coastal plain, the limits of which

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[5] Term "game ducks" here refers to: mallard, black duck, gadwall, baldpate, blue-winged teal, green-winged teal, shoveller, wood duck, red head, canvasback, ring-necked duck, greater scaup, lesser scaup, white-winged scoter and ruddy duck.
[6] The first ten miles of the Pakwa River after leaving the village of Pagwa traverses the Shield, (Williams, 1921).

Fig. 1. Map showing the Pre-Cambrian Shield, Palaeozoic Basin and limit of trees in Canada (from official Canadian maps).

extend from Churchill on Hudson Bay to a distance of 60 miles south of James Bay and between 180-240 miles west of James Bay. Underlying the Basin are nearly horizontally bedded limestones of Devonian, Silurian and Ordovician age. Over these rock strata lies a water-impervious clay which is primarily responsible for the development of muskeg, the type of vegetation covering almost the entire Basin, fig. 1.

The rivers of the Palaeozoic Basin flow over bed rock. They reach peak flood stage at the ice breakup and then begin a steady drop in level until the succeeding autumn, fig. 3. In summer, the Pagwa River is reported to run nearly dry in places, while the Kenogami River has shallow rapids in some sectors, but is of considerable depth along its lower reaches. The upper Albany River, between The Forks and Ogoki, has been aptly described as simply a fast chute and even at flood stage approaches a rapid in many places. In June, 1947, the current of the Albany River above The Forks was estimated to flow at the rate of 8-10 miles per hour. No important river enters the Albany in this section. Below The Forks the Albany River is wider and the current is somewhat slower. Four large islands and a number of smaller ones occur in its lower reaches, while its estuary contains a multitude of large and small islands.

These rivers have built up natural levees along most of their lengths from ice action and deposition during floods. White and black spruce and balsam fir of appreciable size are limited to the levees and to the islands; the interior lower lying muskeg contains only stunted black spruce and tamarack. Most of the Kenogami and Albany River country was swept by fire in the early part of the century with the result that except on islands and in protected or low places, aspen and birch are now the predominant trees on the river terraces.

Fig. 2. Map showing routes of travel by the authors in Ontario and Quebec.

The route travelled in Quebec was through "A high, rolling plateau, which rises somewhat abruptly, within a few miles of the coast line, to heights between 1,500 and 2,000 feet, the latter elevation being somewhat greater than the watershed of the interior. The interior country is undulating, and is traversed by ridges of low rounded hills that seldom rise more than 500 feet above the surrounding level." (Low, 1896) Sections of the Pre-Cambrian Shield near James Bay rise so slowly that 100 miles inland the elevation is only 700 feet above sea level, while at Lake Mistassini the elevation is reported to be 1,300 feet.

Lakes in the interior of the Labrador Peninsula of Quebec are estimated by Low (1896) to cover approximately one-fourth of the total land area. The largest lake is Lake Mistassini which covers about 1,200 square miles, table 1. According to Low, most of the lakes seldom exceed 50 feet in depth and many are under 20 feet. These are generally characterized by having shorelines highly dendritic in outline.

Differing from this interior lakeland is the coastal plain, a belt about 100 miles in width lying along James Bay. This area, which is covered with a deep mantle of marine sands and clays that have filled in the depressions and prevented the formation of lakes, is cut by a network of small streams (from Low 1896).

The soil of the Shield is "derived from the underlying Archean rocks, and is mostly in the form of glacial till, mixed with boulders of various sizes". At the time (1892-1894) Low made his survey of the Labrador section of the Shield, black spruce was estimated to compose 90 per cent of the forest with white spruce, tamarack, balsam fir, birch and aspen making up most of the remainder. These species are present in the Palaeozoic Basin but, with the exception of the black spruce and

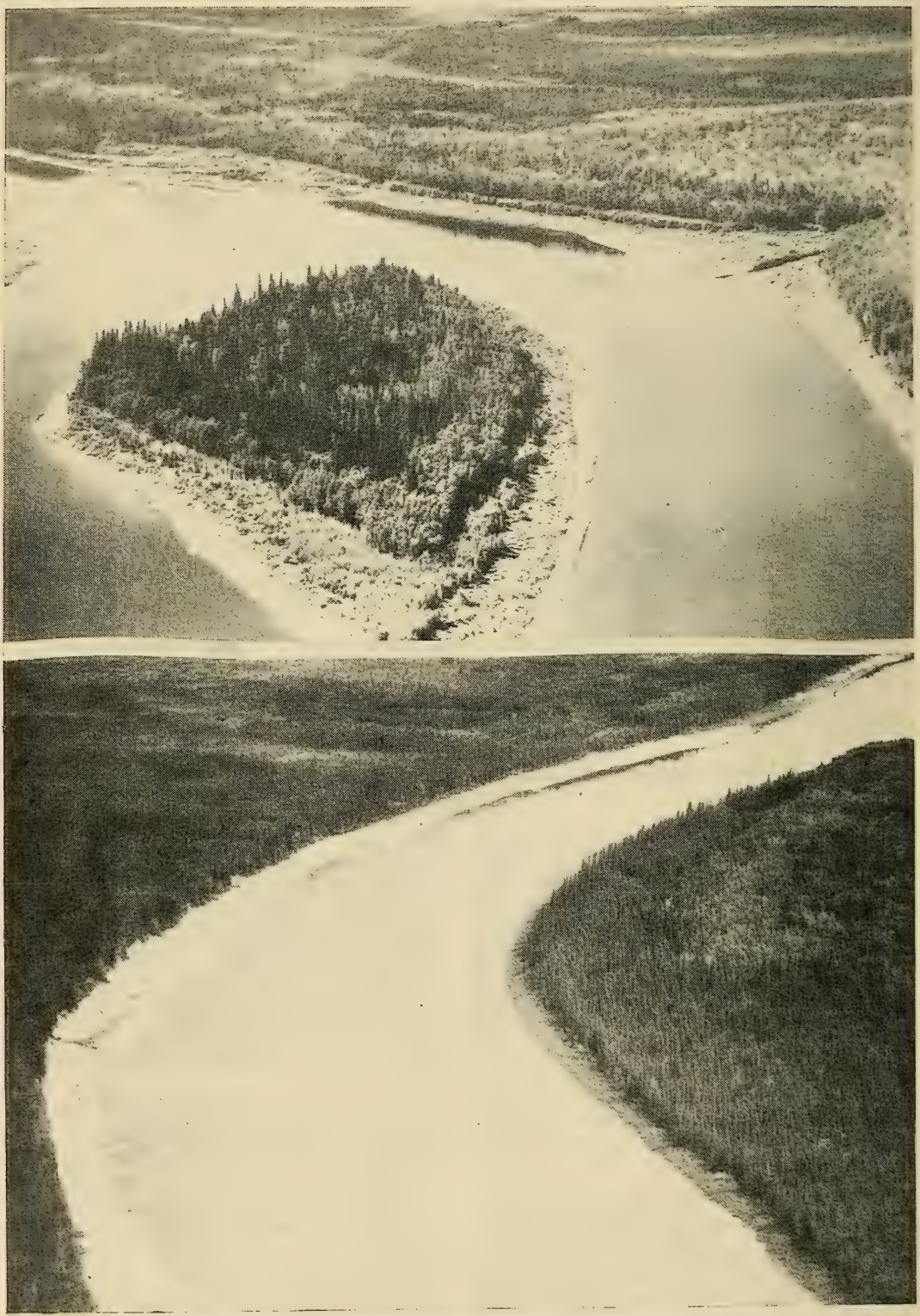

Fig. 3. Two typical rivers in the Palaeozoic Basin. The upper photograph shows the Albany River 21 miles below Ogoki; the lower photograph is of the Ekwan River, approximately 62 miles from its mouth on James Bay.

TABLE 1. — NOTES ON SOME WATER AREAS TRAVERSED ON THE PRE-CAMBRIAN SHIELD.

Lake Travelled	Approximate Area or Length	Remarks
Gouin Reservoir	450 sq. mi.	Extremely dendritic in outline. Figure 2 shows generalized outline. Contains many islands, some over 12 miles in length, shorelines studded with dead trees, live timber, second growth spruce and aspen.
Lake Dubois	12 sq. mi.	Shallow, contains a number of rocky islands, shoreline rocky.
Lynxeye Lake	18 sq. mi.	About one quarter of shoreline burnt over.
Lake Gabriel	18 sq. mi.	Contains islands. They and virtually all of the surrounding country burnt over in recent years.
Lake Nemenjish	10 sq. mi.	Has several marshy areas with *Scirpus* margins.
Lake Obatogamau	40 sq. mi.	Contains a multitude of large and small islands, shoreline nearly all rocky.
Lake Chibougamau	90 sq. mi.	Contains rocky islands, shoreline of rocky outcrops and boulders, country south of this lake rolling drift-covered hills.
Lake Dore	30 sq. mi.	Contains rocky islands, country north of here rocky and of marked relief. Shoreline sandy, grasses and rushes in small bays and mouths of creeks, shoreline of bedrock or boulders.
Lake Mistassini	1,200 sq. mi.	Most of the surrounding country has been burned over, now replaced in part by second growth.
Lake Albanel	300 sq. mi.	Contains very many rocky islands; shoreline rocky.
Rupert River	277 mi.	Upper third of river varies in width from 100 yards to 1 mile, contains many small rocky islands, current swift. Lower third contains numerous falls and rapids.

tamarack, occur mainly on the river terraces. Jack pine occurs on the Pre-Cambrian Shield but only rarely in the Palaeozoic Basin. Additional notes on this area are presented in table 1.

TIME AND COVERAGE OF OBSERVATIONS

The period of time over which each series of observations was made differs considerably, as can be noted from tables 2, 3 and 4. This time factor alone invalidates too close a comparison of each set of figures, but some of the resultant differences tend to cancel out each other. For example, the observations in the Palaeozoic Basin were made only during the month of June, when many of the females would not be observed because of egg laying or incubation. However, to offset the absence of some females, single drakes were occasion-

TABLE 2. — NUMBERS OF WATERFOWL OBSERVED ALONG A WATER ROUTE THROUGH

Section of Water Route Travelled	Dates of Travel	Mileage	BLACK Duck			American
			Number Observed	Per cent of Total	Per 100 Miles	Number Observed
Pagwa River (C.N.R. line to Kenogami River)	June 3-4	32	6	24	19	14
Kenogami River (mouth Pagwa River to Mammamattawa)	June 4	24	5	12	21	13
Mammamattawa to mouth of the Kenogami River	June 6-7	58	4	28	7	5
Albany River (Ogoki to The Forks)	June 16-17	82	0	0	0	13
Albany River (The Forks to mouth of Chippie River)	June 17-18	57	0	0	0	8
Albany River (mouth of Chippie River to first islands in the estuary of Albany River)	June 18-20	78	7	28	9	0
Total or Average		331	22	16	7	53

ally observed on the rivers of the Palaeozoic Basin swimming about in small areas of quiet water close to shore. The reluctance of some drakes to flush gave the impression that the spots they occupied may have been waiting territories, if this concept of territory (Hochbaum 1944) applies to mergansers as well as to certain other species of ducks.

A similar situation would exist for the observations made in June in the Pre-Cambrian country, but from mid-July on the situation would be reversed. The females with broods would be most conspicuous, while the yearling birds and drakes would be undergoing the moult, at which time they could be expected to be especially wary and inconspicuous and to be congregated near the center of the larger bodies of water.

Observations made after August are probably no longer indicative of the local nesting population as by that time many of the young are on the wing and with the adults are participating in extensive local movements or are beginning to migrate. This seasonal shift in the behavior of the duck population is best illustrated by the influx of black ducks into areas which contained relatively few ducks in the early part of the summer, table 4. Hence, figures used in comparing waterfowl populations in the two areas are based mainly on observations up to September.

Another factor to be considered in interpreting the data presented is that the observations made on large bodies of water, such as Gouin Reservoir and Lake Mistassini, would include ducks noted along one shore line and on or above the open water on the opposite side of the canoe for a distance of from one-eighth to one-quarter of a mile. Tables 2, 3 and 4 include only the totals of adult ducks tallied, brood records being presented in the text and in tables 5 and 6.

The number of miles travelled was obtained by using a map measure on 8 mile - 1 inch maps (National Topographic Series). Actual distances covered in many instances exceed the calculated mileage by about 25 per cent due to the observers following irregularities in the shoreline. However, as many birds were observed only while in flight, the number that would have been tallied had a more direct course been chosen, probably would not differ appreciably from the totals given in tables 2, 3 and 4. In any event, in converting observations to 100 miles of travel, it was deemed wisest to base distances on the best available standard—the 8 mile-1 inch maps—rather than on personal estimates of distances.

WATERFOWL POPULATIONS

In the two regions under discussion, exclusive of the islands and coastal marshes of James Bay, apparently only four species of ducks

THE PALAEOZOIC BASIN OF ONTARIO BETWEEN PAGWA RIVER AND FORT ALBANY.

SPECIES OBSERVED								Total		
Golden-eye		American Merganser			Hooded Merganser					
Per cent of Total	Per 100 Miles	Number Observed	Per cent of Total	Per 100 Miles	Number Observed	Per cent of Total	Per 100 Miles	Number Observed	Per cent	Per 100 Miles
56	44	3	12	9	2	8	6	25	100	78
30	54	20	46	83	5	12	21	43	100	179
36	9	5	36	9	0	0	0	14	100	25
42	16	18	58	22	0	0	0	31	100	38
100	14	0	0	0	0	0	0	8	100	14
0	0	18	72	23	0	0	0	25	100	32
36	16	64	43	19	7	5	2	146	100	44

breed at all commonly: the black duck, American golden-eye, hooded merganser and American merganser. A few other species occur in migration, chiefly the scoters which are common on the Albany River in late May and early June.

Data presented in tables 2, 3 and 4 indicate that the total nesting duck population on the lakes and rivers of the Pre-Cambrian Shield east and southeast of James Bay is roughly 70 per cent greater than that along the rivers of the Palaeozoic Basin west and southwest of James Bay. Accounting for most of the difference in the size of the waterfowl populations in these two regions is the American merganser. Traverses of the muskeg country of the Palaeozoic Basin on foot and extensive cross-country flights at low elevations revealed that only a meagre black duck population is found on the innumerable sphagnum bogs and lakes that lie off from the main rivers.

In addition to the species treated here, nearly the entire Mississippi valley flyway population of Canada geese nests in the interior lake country of the Palaeozoic Basin, fig. 4. This population is the subject of a separate report (Hanson and Smith, 1949).

LIST OF SPECIES

Black Duck

Anas fulvigula rubripes.—In the Palaeozoic Basin the observed occurrence of black duck varied from 0—21 individuals per 100 miles of travel and averaged 7; on the Pre-Cambrian Shield their observed frequency in 1947 varied from 0—33 per 100 miles and averaged 11. In 1948, the computed frequency varied from 0—33 and averaged 20 individuals per 100 miles. In the Palaeozoic Basin this species composed about 16 per cent of the duck population; on the Pre-Cambrian Shield, 14 a[illegible] 20[7] per cent of the observed population.

The local occurrence of black ducks in the Palaeozoic Basin correlated in part with the presence of a few seemingly ideal nesting lakes which lie close to the rivers. These lakes, small in size, lack the extensive sphagnum development of the interior muskeg lakes and are bordered by tall grasses and sedges and are generally surrounded by dense stands of aspen or spruce. The distribution of black ducks on the main rivers also partially coincided with quiet stretches of water. The black duck was conspicuously absent between The Forks and Ogoki where the Albany River is particularly swift and where no lakes lie close by. Bell (1887) reported the dusky (black) duck as being numerous on the Attawapiskat River. Macoun and Macoun (1909) reported a few breeding on the Missinaibi River. Williams (1921) recorded black ducks

[7] It should be kept in mind that 6 and 11 percent of the ducks observed on the Pre-Cambrian Shield were not identified. Hence these and subsequent figures on this area are approximate only.

TABLE 3. — NUMBERS OF WATERFOWL OBSERVED IN 1947 ALONG WATER ROUTES ON

Section of Route	Dates of Travel	Mileage	Black Duck			Am
			Number Observed	Per cent of Total	Per 100 Miles	Number Observed
Oskelaneo River*	June 8-9	12	3	100	3	0
Gouin Reservoir	June 9-13	56	7	19	12	24
From Gouin Reservoir to Post Bay, Lake Mistassini	June 14-July 4	128	8	7	6	26
Lake Mistassini and Lake Albanel	July 4-22	90	0	0	0	3
Temiscamie River	July 23-24	12	0	0	0	2
Lake Albanel and Lake Mistassini	August 2-5	52	0	0	0	0
From Outlet of Lake Mistassini to Outlet of Lake Mesgouez on the Rupert River	August 7-13	100	3	2	3	11
From Outlet of Lake Mesgouez to Hudson Bay Co., Lake Nemiska	August 14-21	72	24	30	33	0
Lake Nemiska to Rupert House	August 21-31	105	23	64	22	1
Total or Average		627	68	14	11	67

* From Oskelaneo to Gouin Reservoir.

only in the estuary of the Albany River between August 18 and 20.

From traverses on foot and plane flights it is concluded that relatively few black ducks breed on muskeg ponds and lakes that lie away from the main rivers and coastal marsh areas of the Palaeozoic Basin. Only one pair was noted during two five-hour walking trips in the small lake country 25 miles up the Lawapiskau River in early July, and none was seen in the course of two foot trips in the lakeland muskeg about 40 miles up the Albany River during the last week of July, fig. 4.

The aerial survey in mid-July, 1947, covered the following flights over the muskeg: Fort Albany to Ogoki and return; Fort Albany to Weenusk; York Factory to Fort Severn and Fort Severn to Weenusk via inland routes, a total of about 1,054 miles. Although 150 Canada geese, adults and goslings combined, were tallied from a population of approximately 55,000 geese believed to have returned to the muskeg breeding grounds that spring (Hanson and Smith, 1947), black ducks were observed only twice: a pair, and a flock of about 40, the latter presumably drakes which had banded together after the nesting season. Both black duck observations were made in the 35-mile wide area of lakeland muskeg that lies between the Albany and Atikameg rivers approximately 25 miles inland from the west coast of James Bay [8].

Data from the Pre-Cambrian Shield country suggest that the most favorable nesting conditions for black duck are found along the smaller rivers. Low (1896) records the black duck as being uncommon throughout the interior of the Labrador Peninsula. Faribault et al. (1911), however, reported seeing many black ducks in the Chibougamau region, especially on Rush Lake. The species is a common breeder in the Lake St. John region (Godfrey and Wilk, 1948). In Algonquin Provincial Park, MacLulich (1938) found black ducks mainly near marshy creeks. In the lake Abitibi region (Snyder, 1928) black ducks are reported to nest along flooded creek beds and shallow

[8]) On August 5, 1949, another transect was flown in the Palaeozoic Basin by Hanson. This transect began in the Winisk River country 15 miles inland from the south coast of Hudson Bay and terminated a few miles north of Lake River on the west coast of James Bay. The flight, a distance of 100 miles, was made at a 200-ft elevation and the strip observed was approximately one-eighth mile wide. In this 16-quare-mile sample, only one duck, a black duck, was noted.

PRE-CAMBRIAN SHIELD IN QUEBEC.

SPECIES OBSERVED								Total		
Golden-eye		American Merganser			Unidentified					
r cent Total	Per 100 Miles	Number Observed	Per cent of Total	Per 100 Miles	Number Observed	Per cent of Total	Per 100 Miles	Number Observed	Per cent	Per 100 Miles
0	0	0	0	0	0	0	0	3	100	20
62	43	7	19	12	0	0	0	37	100	67
23	20	73	68	57	1	2	1	108	100	84
5	3	52	93	58	1	2	1	56	100	62
40	20	3	60	25	0	0	0	5	100	42
0	0	17	53	33	15	47	29	32	100	17
9	11	107	85	107	5	4	5	126	100	126
0	0	53	67	74	2	3	3	79	100	110
4	1	8	25	8	2	7	2	34	100	32
14	11	320	66	51	26	6	4	481	100	76

bogs; in the vicinity of Lake Nipissing, they were frequently noted on small lakes and ponds as well as on Lake Nipissing itself (Ricker and Clarke, 1939).

A female black duck with a newly hatched brood of eight was encountered among the willow covered islands in the estuary of the Lawapiskau River on July 3, 1947. Black duck broods were observed in the Pre-Cambrian Shield only in 1948, table 6.

American Golden-eye.

Bucephala clangula.—Along the rivers of the Palaeozoic Basin, 9-54 golden-eyes were sighted per 100 miles of travel and the average for all rivers travelled was 16 birds per 100 miles. On the Pre-Cambrian Shield the rate of occurrence of this species in 1947 was 0—43 individuals per 100 miles and the average number was 11. In 1948, 3—33 individuals per 100 miles were tallied and the average was 13. This species accounted for 36 percent of the duck population in the Palaeozoic Basin and 14 and 19 per cent of the population on the Pre-Cambrian Shield.

It is difficult to associate the number of observations of this species with any particular feature of the land. In the Palaeozoic Basin the golden-eye was most abundant along the lower Pagwa River and upper portions of the Kenogami River. The levees along these sections are bordered by extensive stands of spruce, whereas the section of the Kenogami River below Mammamattawa and the Albany River where golden-eyes were less numerous is bordered by aspen. Williams (1921) recorded only seven golden-eyes on his trip down these rivers. Two were observed at the mouth of the Pagwa River and five were seen about 16 miles below The Forks of the Albany River on August 5 and 14 respectively.

On the Pre-Cambrian Shield, the American golden-eye was most common on the small to medium sized lakes, on the lake-like expansions of the upper Rupert River, and notably so on the Gouin Reservoir in both years. Although their numbers in the latter locale might be related to the large number of dead trees which border the shores of this impoundment and which presumably supply abundant cavities for nesting, Munro (1939) states that the nesting lakes of the Barrows golden-eye are selected first on the availability of food and secondly on the abundance of nesting sites. Low (1896) has recorded the American golden-

TABLE 4. — NUMBERS OF WATERFOWL OBSERVED IN 1948 ALONG WATER ROUTES ON

Section of Route	Dates of Travel	Mileage	Black Duck			American
			Number Observed	Per cent of Total	Per 100 Miles	Number Observed
Gouin Reservoir*	June 17-18	24	1	7	4	8
From Gouin Reservoir to Post Bay, Lake Mistassini**	June 19-July 4	128	8	8	6	29
Lake Mistassini and Lake Albanel	July 5-20	90	2	3	2	3
Temiscamie River, Tournemine River and Lake Tournemine	Aug. 1-14	49	16	41	33	5
Lake Albanel and Lake Mistassini	Aug. 21-Sept. 4	90	22	70	25	3
Total or Average		381	49	20	20	48
From Post Bay Lake Mistassini through Lake Obatogamau	Sept. 5-13	72	31	59	43	8
From Lake Obatogamau to Gouin Reservoir***	Sept. 14-22	68	86	59	126	15
Gouin Reservoir	Sept. 22	56	1	10	2	0
Oskelaneo River****	Sept. 23-25	12	64	52	533	6
Total or Average		298	204	56	68	32

* From Obijuan, Hudson Bay Co. post, to mouth of river at northeast end of Bay Verrau.

** Includes approximately 22 miles of travel on creeks and small rivers connecting various lakes.

*** Via Lakes Malo, Jourdain, Ducharme, River Scatsi, Lakes Potrincourt, Buade and Normandin.

**** From Gouin Reservoir to Oskelaneo.

eye only from the upper Hamilton River and at Lake Mistassini. Macoun and Macoun (1909) write that none was seen in the interior of Labrador. At Lake St. John this species is outnumbered only by the black duck (Godfrey and Wilk, 1948).

An adult female weighing 2 lbs. 4 oz. was shot on the Kenogami River near its juncture with the Current River. This bird was without fat, had an open oviduct, and the five largest follicles of the ovary measured 3 mm. in diameter.

After this paper was completed, an interesting account of bird distribution along the Peace, Slave and Little Buffalo rivers appeared (Eaton, 1948). Of eight species of ducks observed, the American golden-eye was second in abundance only to the mallard. Eaton's data (p. 348) are comparable to those presented here if the number of adults observed is converted to the number observed per 100 miles of river travel. On the section of the Peace River cutting through the Alberta Plateau, the tally was 24 adults per 100 miles; from Fort Vermilion to the juncture of the Peace and Slave rivers, 14 adults per 100 miles; on the Slave from its confluence with the Peace to Fitzgerald, 38 per 100 miles; and from Fitzgerald to Grand Detour, on the Slave River, 25 per 100 miles. None was seen on the Little Buffalo River. The observations from which these data were calculated were made from June 15 to July 8, 1940. The average number observed on these three rivers, 19 per 100 miles, suggests that the populations of American golden-eye are somewhat higher in suitable habitat in the interior plain of Canada than on the Pre-Cambrian Shield.

THE PRE-CAMBRIAN SHIELD IN QUEBEC.

SPECIES OBSERVED								Total		
Golden-eye		American Merganser			Unidentified					
Per cent of Total	Per 100 Miles	Number Observed	Per cent of Total	Per 100 Miles	Number Observed	Per cent of Total	Per 100 Miles	Number Observed	Per cent	Per 100 Miles
58	33	3	21	12	2	14	8	14	100	58
30	22	49	51	38	11	11	8	97	100	75
5	3	51	77	57	10	15	6	66	100	73
13	10	17	43	35	1	3	2	39	100	80
10	3	3	10	3	3	10	3	31	100	35
19	13	123	50	32	27	11	7	247	100	65
16	11	4	8	6	9	17	13	52	100	72
10	22	38	26	56	8	5	12	147	100	217
0	0	9	90	16	0	0	0	10	100	18
5	50	14	11	117	40	32	334	124	100	1,032
9	11	68	19	23	60	16	20	364	100	122

American Merganser

Mergus merganser. — In the Palaeozoic Basin between 0—83 American mergansers were tallied per 100 miles of canoe travel and the average for the three rivers travelled was 19 individuals per 100 miles. The rate of occurrence on the Pre-Cambrian Shield in 1947 varied between 8 and 107 birds per 100 linear miles of lakes and rivers and averaged 51. In 1948, between 3 and 57 individuals and an average of 32 were observed per 100 miles. In the Palaeozoic Basin this species composed about 43 per cent of the nesting duck population; on the Pre-Cambrian Shield, 50 and 66 per cent of the population. Most notable densities of these birds were on the Kenogami River and on the upper third of the Rupert River.

The higher population of American mergansers on the waters of the Shield than along the rivers of the Basin corresponds with the greater fish population present in the rivers and lakes of the former region. No mergansers were found on the muskeg lakes of the Palaeozoic Basin—probably because most of these lakes are shallow and freeze solid in the winter, thereby precluding the survival of most fish.

Macoun and Macoun (1909) report this species common and breeding along two other large rivers of the Palaeozoic Basin, the Missinabi and the Moose, but also express the belief that in Ontario this merganser prefers inland lakes bordered by woods and not large expanses of open water. Low (1896) says that it is common throughout the interior of the Labrador Peninsula; Faribault *et al.* (1911) found this species widespread along the waterways of the Lake Chibougamau region; Godfrey and Wilk (1948) found it fairly common on Lake St. John in 1946, and in 1947, Godfrey

TABLE 5. — **BROODS OF AMERICAN MERGANSERS OBSERVED ON LAKE ALBANEL AND THE RUPERT RIVER, QUEBEC, 1947.**

Locality	Date	Size of Brood	Estimated Age
Lake Albanel	July 22	3	1 week old
Rupert River	Aug. 8	14	3-4 " "
"	" 8	6	3-4 " "
"	" 10	4	2 " "
"	" 10	1	3-4 " "
"	" 11	6	3-4 " "
"	" 11	4	3-4 " "
"	" 12	6	3-4 " "
"	" 12	5	3-4 " "
"	" 12	2	Nearly ad. size, wings stubby
"	" 13	2	" " " " "
"	" 15	3	" " " " "
"	" 16	6	Nearly able to fly
"	" 17	1	Nearly ad. size, wings stubby
"	" 17	2	" " " " "
"	" 17	4	" " " " "
"	" 20	6	Flying stage
"	" 20	5	" "
"	" 22	3	2-3 weeks old
"	" 25	2	3-4 " "
Average		4.3	

and his party observed a total of 23 individuals between June 26 and August 8 in the Lake Mistassini region.

A yearling male weighing 3 lbs. 2 oz., was collected 18 miles below the juneture of the Pagwa and Kenogami rivers on June 3, 1947, by Hanson. The bursa of this male was open and its testes measured 15 x 5 mm. Two downy young about one week old were collected from a brood of six on the Albany River near the head of the islands on July 28. A canoe party that reached Ft. Albany on July 27, also via the Pagwa, Kenogami and Albany rivers, reported seeing only five broods; four were sighted on the Kenogami River and one on the Albany River. Broods observed in Quebec are summarized in tables 5 and 6.

Hooded Merganser

Mergus cucullatus.—The hooded merganser was noted only along the Pagwa and Kenogami rivers where field observations indicated an abundance of 0—21 individuals per 100 miles of travel. The average rate of occurrence was two per 100 miles. This merganser made up about five per cent of the duck population in the Palaeozoic Basin.

Macoun and Macoun (1909) credit Spreadborough with finding the hooded merganser breeding from the Missinabi River to Cape Henrietta Maria. They also report that a pair was observed by Spreadborough in the interior of Labrador on July 16, 1896, although this record is omitted by Low (1896) in his list of the birds of the interior of the Labrador

TABLE 6. — BROODS OBSERVED IN QUEBEC IN 1948.

Species	Locality	Date	Size of Brood	Estimated Age
Black Duck	Nemenjish River	June 24	6	About 2 weeks
American Golden-eye	Temiscamie River	July 20	7	About 1 week
" "	" "	Aug. 1	5	About 1 week
Black Duck	" "	Aug. 5	7	With female, capable of flight
American Golden-eye	Tournemine River	Aug. 6	11	Nearly mature
American Merganser	" "	Aug. 6	9	Nearly mature, stubby wings
" "	Lake Tournemine	Aug. 7	1	Nearly mature
" "	" "	Aug. 7	6	About 4 weeks
" "	Temiscamie River	Aug. 12	12	About 5 weeks
Black Duck	" "	Aug. 14	1	5 - 6 weeks
American Merganser	Lake Albanel	Aug. 26	5	———
" "	Lake Mistassini	Aug. 27	6	5 weeks
" "	" "	Aug. 27	8	5 weeks
" "	Lake Chibougamau	Sept. 9	12	Nearly full-grown
" "	Lake Obatogamau	Sept. 13	7	Nearly full-grown
" "	Portage route from Lake Obatogamau	Sept. 15	6	Nearly full-grown
" "	Lake Ducharme	Sept. 16	11	About one half of brood able to fly
" "	Lake Ducharme	Sept. 16	7	About one half of brood able to fly

Peninsula. Gabrielson (1938) observed a female and four half-grown young near Maniwaki, Quebec, on July 29, 1937. A. L. Wilk (Godfrey and Wilk, 1948) collected a yearling male at Lake St. John on August 14, 1946. W. Earl Godfrey (*in litt.*) informs me that this species has been reported in the summer from Anticosti Island and that Comeau (1909) reported it near Godbout on September 4, 1885, and on September 10, 1889. In 1947, on July 22, Godfrey and his party saw two females apparently accompanied by young on Lake Mistassini. The meagerness of these records and the failure of Murray and Edward Rogers to find it on their traverses of the Pre-Cambrian country is indicative of its rareness in Quebec north of the St. Lawrence River, a fact also alluded to by Cooke (1906). The centre of abundance of the hooded merganser in Canada is northern Manitoba, according to Macoun and Macoun (1909).

A fully grown juvenile, one of a pair observed, was collected by Hanson at the mouth of the north branch of the Albany River on July 31, 1947.

OTHER SPECIES

Several species of ducks, other than those listed above, were observed. These were either migrants or rare breeders.

Mallard

Anas platyrhynchos.—A drake was flushed from the Kenogami River below Mammamattawa. There are no data to indicate that this species breeds in the interior of the section of the Palaeozoic Basin west of James Bay although it is a common nesting duck on the coastal marshes.

Green-winged Teal

Anas crecca.—A single drake was noted a few miles from the mouth of the Pagashi River on June 18. When this river was descended on the following day, this bird was again sighted at the same place and hence may have had an incubating mate nearby.

Buffle-head

Bucephala albeola.—Two drakes of this species were observed by Murray and Edward Rogers: one on Pike Pond on June 19, 1947; and one on a portage route to Lake Chibougamau on September 12, 1948.

Greater Scaup Duck

Aythya marila.—Three female scaup, identified as greaters, were observed by the Rogers' on Lake Chibougamau on September 12, 1948.

Ring-necked Duck

Aythya collaris.—Two drakes and a hen were observed on May 26 on the Pagwa River at the village of Pagwa River. These individuals were evidently still in migration. In Ontario, the ring-neck is known to nest with certainty only in the southern Kenora and Thunder Bay districts (Baillie and Harrington, 1936). There is one record of an adult male, observed on June 29 in the Sault Ste. Marie region (Snyder, Logier and Kurata 1942).

American Scoter

Melanitta nigra.—In late May and early June, large numbers of American scoters congregate along the lower Kenogami River and on the Albany River, particularly near The Forks. These birds are migrants only through this area and by the end of the first week in June the migration is largely over. A total of seven drakes and one hen was tallied during the periods of observations listed in table 2.

The Indians, while en route from their winter trapping camps to the various posts, kill fair numbers of American scoters for food. At camp sites along the lower Kenogami River, scoter wings often littered the ground or were festooned on bushes and small trees, a custom no doubt related to the superstitions of the local Indians.

Skins of four drakes were obtained from specimens shot by the Indians at The Forks. The bursas of these four birds were closed; each had badly worn tail feathers; and all were fat, or moderately fat, according to the categories proposed by McCabe (1943). Their weights were as follows: 2.0 lbs., 2 lbs. 4 oz., 2 lbs. 4 oz., and 2 lbs. 6 oz. [Kortright (1942) gives 2 lbs. 8 oz. as an average for seven males.] The testes of all four were enlarged, the members of each pair being unequal in size. The measurements of two pairs were as follows: 23 x 10 and 15 x 8; 25 x 10 and 17 x 7 mm. Only one female was recorded out of 12 individuals shot and observed, a fact suggesting that the stragglers in the spring flight may be largely unmated males.

Surf Scoter

Melanitta perspicillata. — This species occurs less commonly in migration on the Kenogami and Albany rivers than does the black scoter. A drake shot by Indians at The Forks on June 7 was made up into a skin. This specimen had a closed bursa, was moderately fat and weighed 2.0 lbs. The tail feathers, excepting one central one (the other was missing), of this bird were unworn with entire tips.

On the morning of June 14 a courting party of three adult drakes and one hen was observed in a quiet bay of the Albany River about five miles below the mouth of the Gander River. Apart from these four birds were three drakes whose plumages indicated that they were yearlings.

OTHER SECTIONS OF THE SHIELD AND BASIN

In the two regions traversed by the authors, non-game ducks, the American golden-eye, the hooded merganser and the American merganser, constitute roughly 80-85 per cent of the total duck population. Black duck make up the remainder. Although scattered sparsely, in the aggregate the black ducks from these two areas may account for a considerable portion of the total population of this species on the continent.

Pertinent data from the literature regarding duck populations in other sections of the Palaeozoic Basin and of the Pre-Cambrian Shield are briefly summarized here.

Newfoundland - Labrador

The black duck is the only common breeding species of game duck in this section of the Pre-Cambrian Shield. Other non-game species breeding in the interior are the American golden-eye, the eastern Harlequin duck and the red-breasted merganser. While the status of the American merganser in Newfoundland-Labrador appears to be questionable it doubtless occurs there (from Austin 1932).

Quebec

The forested areas of the Pre-Cambrian Shield in Quebec contain few game ducks other

Fig. 4. Lakeland muskeg just north of the Albany River. 40 miles in land from the coast of James Bay.

than the black duck. The pintail is a rare summer resident in the Lake St. John region (Godfrey and Wilk, 1948) but it is believed to breed in considerable numbers in the Povungnituk region and on the King George and Sleeper Islands in Hudson Bay (Manning, 1946), localities which lie well north of the limit of trees.

The green-winged teal is not uncommon and breeds at Lake St. John (Godfrey and Wilk, 1948). This teal is said by the local residents to breed regularly in the vicinity of Fog Island along the north shore of the St. Lawrence River (Lewis, 1927). It also may reappear in a few scattered but favorable localities near the limit of trees, as fully fledged young females were collected by Turner (1885) in late July at Fort Chimo.

The ring-necked duck is a scarce breeder, being known from the Lake St. John region, and having been recorded as breeding at Lake St. Edward, 16 miles north of Quebec City, at Rush Lake, Frontenac Co., and at Messines, Gatineau Co. (Cayouette, 1945).

Ontario

Mallards have been recorded as breeding in the Cat Lake (Wilson, 1902) and Lac Seul region, in western Ontario adjacent to the Manitoba border (Baillie and Harrington, 1936), and in the western Rainy Lake district (Snyder, 1938). A few pairs of wood duck and green-winged teal nest in the Lake Nipissing area (Ricker and Clarke, 1939) and small numbers of wood duck breed in Algonquin Provincial Park (MacLulich, 1938). Blue-winged teal occasionally breed on the edge of the Shield and north to Lake Nipissing in Ontario (Baillie and Harrington, 1936), although not recorded in the latter locality by Ricker and Clarke (1939). There is one record for the Sudbury district (Baillie and Hope, 1947) and it occurs sparingly in the southern part of extreme western Ontario. Soper (1923) noted only the American merganser, black duck and American golden-eye in portions of the Nipissing and Timiskaming districts in 1922.

In contrast to the scarcity of game ducks in the interior of the Pre-Cambrian Shield and the Palaeozoic Basin of Ontario is the relative abundance of game ducks on the coastal marshes of Hudson and James bays, fig. 5. In order of abundance, the species that occur are: pintail, black duck, green-winged teal, mallard, baldpate and blue-winged teal. On a flight along the coastal marshes between Ft. Severn and Attawapiskat on July 18, 1947, Queneau and Hanson identified the following ducks: pintail, 1,300; black duck, 260; green-winged teal, 115; and mallard, 40. However, a check of some estimates made from the air with photographs of the same flocks indicated considerable underestimation, at least in some instances.

In the autumn of 1940, Lewis and Peters (1941) found the last four named species in the marshes of James Bay in the same order of abundance. On June 24, 1947, Hanson collected an adult male baldpate near the mouth of Chickney Channel. Comeau (1914) also reported the pintail to be the most abundant duck on Hudson Bay, and judging from his account, he found the green-winged teal to be second in abundance. O'Sullivan (1905) wrote: "black ducks by the thousand breed in the southern part of Hannah Bay, [Quebec] and the pintail and teal [presumably green-winged] in even greater number, breed north of the Albany." Observations by Spreadborough (in Macoun and Macoun, 1909) and records made in the summer of 1947 by Hanson and by Lemieux and Kelsall (personal communication) substantiate the occurrence of pintail mainly north of the Albany River. Two adult male pintails were collected by Hanson at the mouth of Chickney Channel on June 26, 1947, and flocks of pintails and black ducks totaling many hundreds were observed trading up and down the tide zone during that evening. A female pintail and six five-week-old young were encountered near the mouth of Partridge Creek by Hanson on July 28, 1946.

The duck decline of late decades may have resulted in a thinning out of some species in areas that might be considered marginal range in the light of more recent data. Thus, Survey Party No. 1, of the survey and exploration teams that worked northern Ontario in 1900 (Speight, 1901), found the "black, wood, buff (?) and buff-head" (presumably the bufflehead) ducks and the mergansers between lakes Abitibi and Kesagami. Survey Party No. 3 found mallard, wood duck, bluebill (scaup), widgeon and shoveller along with the American and hooded merganser and American golden-eye abundant in the region between Lake Temagami and the Montreal River. At least one female and a brood of each of these species were observed. Survey Party No. 8 found the mallard in the country west of Lake Nipigon; Party No. 10 found mallards well represented among the ducks in the country between the C.N.R. line and Lac Seul and the English River, west to the western border of the province.

Fig. 5. Coastal marsh of Hudson Bay, 15 miles northwest of the Kaskattama River.

From the data presented above it is obvious that, with the exception of the black duck, game ducks as breeding birds are generally absent from the interior of the eastern half of the Pre-Cambrian Shield.

Are the wooded western portions of the Palaeozoic Basin and Pre-Cambrian Shield more productive of game ducks than the eastern sections? A perusal of the literature relating to these sections indicates not. In fact, they are apt to be considerably less productive since the number of black ducks thins out as the species reaches the western periphery of its range, although to some extent in western Ontario it is replaced by the mallard.

Manitoba

The abundance of game ducks in the prairie potholes and marshes bordering lakes Manitoba, Winnipeg and other lakes in southern and western Manitoba is well known (Thompson, 1890, Shrott and Waller, 1937, Hochbaum, 1944, Williams et al., 1948, the best and most comprehensive account of duck populations in regions south and west of the Pre-Cambrian Shield) but on the Pre-Cambrian Shield and in the Palaeozoic Basin north and west to the limit of trees, markedly fewer ducks are found. There are again a few exceptions to this general picture, i.e., pockets of attractive habitat are found interspersed in this country which is otherwise unsuitable for most kinds of game ducks. Mallards apparently breed along the Hayes River between Oxford House and York Factory (Preble, 1902), and Bell (1880) reported that in 1879 the mallard was the most common duck along the Nelson and Little Churchill rivers where it was found breeding in considerable numbers.

An extremely sparse breeding population of game ducks evidently occurs in the wooded country of extreme northeastern Manitoba and adjacent Keewatin within 200 miles of the limit of trees. During a month of field work in that region, Manning (1948) noted only 7 baldpate, 5 pintail and 4 shoveller.

Like other sections of the coastal marsh of Hudson Bay, the portion lying within the province of Manitoba also produces considerable numbers of game ducks. Between York Factory, Manitoba, and Fort Severn, Ontario, Queneau and Hanson tallied from the air approximately 720 black ducks, 220 pintails and 14 green-winged teal. Preble (1902)

wrote of green-winged teal being killed for food by Indians at Churchill and of seeing large flocks on ponds between Churchill and Cape Churchill in late August. He reported seeing also large numbers of pintail between Cape Eskimo (District of Keewatin) and Churchill. Taverner and Sutton (1934) state that pintail, black duck, baldpate and green-winged teal all nest in the Churchill region, their remarks indicating that these species occur in the above order of abundance. The greater scaup "breeds occasionally and perhaps regularly" and the lesser scaup may also nest there occasionally. Gadwall (Preble, 1902), blue-winged teal and shoveller (Taverner and Sutton, 1934) rank either as rare or occasional breeders in the Churchill district.

Saskatchewan

The distribution of game ducks in Saskatchewan, judging from Mitchell's account (1924) and Williams et al. (1948), does not differ materially from that found for Manitoba. Most species are present in the southern sections, but only a few species (green-winged teal and mallard) are found in the northern part of the province and on the Pre-Cambrian Shield and then only in relatively small numbers.

Buchanan's (1920) records of waterfowl in northern Saskatchewan and an adjacent portion of the Shield in Manitoba made in 1914 are notable for their complete listing of dates and localities, and in many cases of numbers observed. The American merganser and the red-breasted merganser were reported from a number of localities along the Churchill River and from Reindeer Lake, where the latter apparently outnumbered the former. Buchanan also noted the red-breasted merganser along the Cochrane River and on Lake Du Brochet, localities from which he failed to observe the American. His data suggest that as the limit of trees is approached, the red-breasted merganser gradually replaces the American merganser.

The mallard was the game duck most commonly observed by Buchanan. This duck was evidently quite numerous along the Churchill River between Ile à la Crosse Lake and Sandy Lake, localities near the periphery of the Shield; a number of nests were found. Between Sandy Lake and Reindeer Lake, mallards were only occasionally noted, although three nests were found on an island above Kettle Falls on the Churchill River. This species was reported as being scarce on Reindeer Lake, only one brood being noted. On Buchanan's ascent of the Cochrane River to Lake Du Brochet, a distance of about 60 miles, six females, three of which were accompanied by broods, were observed. The pintail was the only other species of game duck observed for which nests or broods were reported. One brood of pintail was noted above Kettle Falls on the Churchill River, and a flock of 18, adult and young combined, were observed on Lake Du Brochet. Occasional records of other game species reported by Buchanan between Ile à la Crosse Lake and Lake Du Brochet include the widgeon, green-winged teal, blue-winged teal, shoveller, greater scaup and white-wing scoter.

Of the country between Lake Athabaska and the Churchill River, Tyrell (1896) writes: " . . . except along the banks of the Churchill River, where ducks breed in great numbers, birds are not at all numerous in the district explored. With the exception of one or two species of merganser, but few ducks were seen, as there is very little food for them in the clear lakes and rivers." The latter remark would not apply to the ubiquitous mergansers as Tyrell also remarks that, "Fish seem to be everywhere abundant in the lakes and streams, but the number of species is very limited."

Alberta

There are no data of consequence regarding waterfowl for that section of the Pre-Cambrian Shield which lies in extreme northeastern Alberta. However, in the low deltaic lands within or just adjacent to the Shield (at lakes Claire, Mamawi, Baril, and the Slave, Peace, Athabaska and Birch River deltas) waterfowl populations (mallard, pintail, shoveller, golden-eye, green-winged teal and baldpate) are reported by Soper (1934) to be of considerable size. On the Birch River delta, Soper estimated that he saw 10,000 - 15,000 ducks in 1933, but on a canoe trip down the Peace, Slave and Little Buffalo rivers in 1940, Eaton (1948) reported seeing only the mallard, baldpate and golden-eye in appreciable numbers. In 1947 Smith (Williams et al. 1948) found the waterfowl populations in this general area disappointing. Seton (1908) reported the green-winged teal and the American golden-eye to be common along the Slave River down to its delta.

District of Mackenzie

West of the perimeter of the Shield in the District of Mackenzie and from the Alberta border to the arctic coast, particularly in the Mackenzie Delta (Preble, 1908; Porsild, 1943), mallard, pintail and baldpate breed abundantly in suitable habitat. However, reports of the

occurrence of these species in appreciable numbers, from the interior of the wooded portions of the Shield in this district, are lacking. Fairbairn (1931) found only the red-breasted merganser breeding on Great Slave Lake and reported no ducks from surrounding areas of the Shield [9].

Wooded country, per se, does not seem to be a deterrent to the presence of nesting populations so long as pockets of suitable habitat exist. This is demonstrated by the present or former abundance of game ducks in the wooded portions of the interior plains of Canada, while the wooded sections of the Shield support relatively few game ducks as suitable habitat is usually lacking. For example, the pintail which is abundant west of the Shield but absent from the forested portions on the Shield, reappears as a common breeder in the Thelon marshes (Clarke 1940) which lie adjacent to the northern limit of trees. It also breeds by the thousands in the Perry River marshes near the arctic sea coast according to Gavin (1948) [10].

DISCUSSION

The range of the American merganser seems to be regulated only by the presence of suitable trees or snags for nesting and an ample fish supply. Escape cover is not needed as the juveniles flee by diving or literally running across the top of the water at great speed. The red-breasted merganser, not requiring trees to nest in, has filled the American merganser's predatory niche north of the limit of trees.

In respect to habitat requirements, the golden-eye seems to occupy an intermediate position between the fish-eating ducks and the game ducks. It nests in trees but is a versatile feeder, eating aquatic insects, amphipods, isopods, aquatic weeds and molluscs (Munro, 1939). These foods occur far less abundantly in the relatively sterile, acid waters of the lakes and sphagnum bogs of the Shield and Basin than in the waters of the interior plains of Canada. Seton (1908), for example, noted golden-eye along the Slave River but not in the country (Pre-Cambrian) east of it.

The waters of the prairie and parkland areas of the interior plains of Canada generally meet all of the requirements of the game ducks: nesting and escape cover are usually plentiful, unless eradicated by man, and food in the form of aquatic plants and small invertebrates is present in surplus quantities. The shallow bays in the Delta marshes, Manitoba, literally swarm with small crustacea and other organisms in the summer; whereas cursory observations indicated that the waters of the muskeg lakes in the Basin are nearly sterile in this respect. The late thawing and breakup of muskeg lakes probably accounts in part for their sterility. During the first few days in July, 1947, traverses on foot of the lake-land muskeg in the Lawapiskau River country revealed that solid ice prevailed from 15 to 18 inches below the open surface of the smaller ponds and beneath the floating sedge mat which covers extensive water areas. Aquatic plants are scarce and emergent vegetation suitable for some nesting ducks is nearly absent.

Pre-Cambrian Shield lakes are unattractive to game ducks as they have relatively little shallow water, and they are generally deficient in plant nutrients and organic soils necessary to support a rich invertebrate population and the kinds of aquatic and emergent vegetation important to many ducks. Exceptions no doubt exist but it is doubtful that they would alter this general appraisal. The deficiency of food suitable for young ducklings, probably more than any other factor, explains the scarcity of game ducks in the lakes and ponds of the Pre-Cambrian Shield and the Palaeozoic Basin.

In brief, the distribution of nesting ducks insofar as lakes are concerned conforms to the general distribution of the three primary types recognized by the limnologists (Welch 1935): the *dystrophic* type, as exemplified by the

[9]) Dr. William MacDonald of Yellowknife, a geologist and acute amateur naturalist who has travelled extensively over the western arctic and sub-arctic regions of Canada, furnished the following notes on duck distribution (personal communication May 1949). In the Snowdrift River country, the pintail is the most common breeding duck. The lesser scaup occurs throughout much of the country east of Yellowknife as does the green- winged teal and widgeon, both of which are said to be quite plentiful. (The range of the lesser (?) scaup also extends for some distance into the Barrens. Although it is scarce there, trapper Mathew Murphy (personal communication May 1949) reported it to be the most common breeding duck in the Musk-ox Lake area.) The white-winged scoter and the surf scoter breed in the Yellowknife district and on the Barrens (also see Clarke 1940), the surf scoter being the more abundant of the two species. The red-breasted merganser breeds on Great Slave Lake and on the Barrens; the American merganser breeds along the rivers flowing into Great Slave Lake and presumably on many of the islands. Flocks of moulting American mergansers, as large as 1,000, have been noted on Great Slave Lake by MacDonald, but he has not observed this merganser on the Barrens.

[10]) Field studies in the Perry River area in 1949 by Peter Scott and the senior author indicated that although considerable numbers of drake pintail come into this region to moult, probably very few pairs actually nest there. One Eskimo questioned said it did not breed there; another reported that a few nested there each year.

sphagnum bogs and lakes of the Palaeozoic Basin, support a meager population of ducks of the dabbling variety (the mergansers and golden-eyes being restricted to the rivers of the Basin), and Canada geese which feed mainly on nearby grasses and sedges and to a lesser extent on the direct biological products of these lakes; the *oligotrophic* type, as typified by the majority of the lakes of the Pre-Cambrian Shield which characteristically support a fair-sized population of American mergansers; and the *eutrophic* type, which is common to most areas south of the Pre-Cambrian Shield and which is capable of supporting a large and varied duck population. A more exacting and satisfactory limnological classification of the water areas of Canada and the United States in relation to nesting ducks is needed to help implement the management program.

The data presented here suggest the need of a classification of the breeding ranges of our waterfowl to suit modern management needs. In the future it would seem desirable to recognize three kinds of ranges and to specify which type is being discussed. They are the *general breeding range, the main breeding range* and the *known breeding range.*

In practice, the general breeding range has been used largely in the past. Cooke (1906) writes about the mallard: "The northern half of the United States west of Pennsylvania, and the whole of Canada west of Hudson Bay, constitutes the principal breeding range in the Western Hemisphere of the mallard." This, of course, is roughly the *general breeding range* of the mallard—not the *main* or "principal" range. The *main breeding ranges* of our waterfowl are in part satisfactorily presented by Kortright (1942) but in many species the ranges given are shown to extend over large areas of western sections of the Pre-Cambrian Shield, where to illustrate, such species as pintail and mallard are altogether lacking or are present in relatively small numbers. The *main breeding range* of the pintail, on the other hand, should be shown as including the west coast marshes of Hudson and James bays south to the Albany River and excluding the forested parts of the Pre-Cambrian Shield lying between Hudson and James bays and the interior plain of Canada.

The *known breeding range* **should** attempt to include all localities in which a species is known to breed with any regularity, even though in relatively small numbers. For example, a map of the known breeding range of the mallard would show portions of the Churchill River and small scattered pockets in western Ontario as part of the productive range.

CONCLUSIONS

Although relatively large numbers of game ducks breed on or just adjacent to the periphery of the Palaeozoic Basin and the Pre-Cambrian Shield — notably in the coastal marshes on the south and west coast of James and Hudson bays, in the region of Lake Winnipeg, along the Athabaska and Slave rivers and their deltas—it appears that the major part of the interior of an enormous area of Canada, bounded on the north by the limit of trees, and on the east, south and west by the perimeter of the Pre-Cambrian Shield, fig. 1, must, with the exception of the black duck and in a few places the mallard, be considered an area relatively unproductive of game ducks.

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OCCURRENCE OF ECHINOCOCCUS GRANULOSUS IN ELK (CERVUS CANADENSIS NELSONI), BANFF NATIONAL PARK [1]

HUBERT U. GREEN

Banff National Park, Banff, Alberta

DURING the past four winters, 1944-45 to 1947-48, one thousand, one hundred and thirty elk in Banff National Park were non-selectively destroyed by gunfire by the Park warden service. Over-utilization of the Bow range by elk necessitated this action in order to balance winter population with range-carrying capacity. One thousand and ninety-three carcasses were salvaged and taken to Park headquarters at Banff for dressing, storage, and disposal as ration meat to the Department of Indian Affairs.

The author, a member of the Park warden service, carried out autopsies on these carcasses to determine current productivity, primary sex ratio, evidence of disease, and the incidence of endo-and ecto-parasites. The lungs of 1,073 of the carcasses were examined for parasitic infection.

This article deals with the occurrence of the larval stage (hydatid cyst) of the cestode, *Echinococcus granulosus,* in the samples examined each year.

Both single and multiple infections were discovered. Single cyst infections were common, and two or three cyst infections occurred frequently. Infections of more than three cysts were comparatively rare, although there were seven cysts on one infected lung and five on another.

The cysts varied in diameter from 2 mm. to 90 mm. They were either round or roughly ovoid in shape. In all cases of multiple infection, the cysts were small.

Lung infection was confined to the dorsal portion of the right and left anterior lobes, largely in the mediastinal region. Large and medium-sized cysts protruded slightly from the tissue in which they were firmly embedded. Small cysts were not visible but their presence was readily detected by palpation.

The effect of parasitism of lung tissue by *E. granulosus* seemed negative. No loss of flesh, functional impairment, or deterioration of the lung tissue was evident.

INTERMEDIATE AND TERMINAL HOSTS

Echinococcus granulosus is an intestinal parasite of the dog, wolf, coyote, and other members of the family Canidae. It is universal in distribution and seems to be common in certain forms of North American mammals in some sections of the continent. (Augustine, 1938).

Hydatid cysts were first recovered from elk of the Rocky Mountain system of National Parks by Cowan (1944), when four adult females were found to be infected in Jasper

[1] Received for publication December 6, 1948.

TABLE 1.

Sex and Age Composition of Elk Examined for *E. granulosus*

Season	Number examined	Over 2 years		Rising 2 years		Calves	
		♂	♀	♂	♀	♂	♀
1944-45	180	28	104	9	15	4	20
1945-46	352	56	198	24	19	30	25
1946-47	297	50	152	19	17	36	23
1947-48	244	13	165	16	11	21	18

TABLE 2.

Sex and Age Composition of Elk Infected

Season	Number infected	Over 2 years		Rising 2 years		Calves		Incidence
		♂	♀	♂	♀	♂	♀	
1944-45	3	1	2	—	—	—	—	1.7%
1945-46	24	7	16	1	—	—	—	6.8%
1946-47	18	11	7	—	—	—	—	6.06%
1947-48	12	10	1	1	—	—	—	4.9%

National Park. Hydatid cysts were first recovered from Banff National Park elk by the author in 1944.

Cowan (1945) removed six hydatid cysts from the lungs of a mule deer *(Odocoileus hemionus)* in Jasper National Park. The author (1944-47) examined the lungs of seven mule deer and one moose *(Alces americana)* in Banff National Park. All were negative to the presence of *E. granulosus.*

Cowan (1943-45) examined one mountain lion *(Felis concolor)*, six coyotes *(Canis latrans)*, and one wolf *(Canis* sp.) in Jasper National Park. The wolf was moderately infected with *E. granulosus,* and the other species were negative.

The terminal host (or hosts) of *E. granulosus* in Banff National Park has not yet been established. Before 1945, the only canid, other than the domestic dog, in and about the Bow range was the coyote. Since then, the occurrence of wolves has been noted by the Park Warden service. By the winter of 1947-1948, the number of wolves on the Bow range was estimated at between nine and twelve. They apparently belonged to one family group.

CONCLUSIONS

The incidence of *E. granulosus* among elk in Banff National Park is confined mostly to the higher age groups. The lungs of only two yearlings (rising 2 year olds) were positive. All of the 177 calves examined were negative.

Vesiculation of the infected organ occurs about two weeks after ingestion of the onchosphere (or onchospheres) and the resulting hydatid usually reaches a diameter of about 1 cm. within five months. Thus, it appears that calves are temporarily immune from infection and that yearlings are largely immune.

The fact that *E. granulosus* was found in elk before the appearance of wolves on the Bow range in any appreciable numbers indicates that the coyote may be the major terminal host.

Observation indicates that the coyote does not prey upon mature elk. However, infection by *E. granulosus* might be accomplished in an elk-coyote cycle by devouring infected lungs as carrion.

If carrion is the medium of infection, the viability of *E. granulosus* exceeds the life of the host.

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KENNICOTT'S SCREECH OWL ON BRITISH COLUMBIA COASTAL ISLANDS [1]

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IN THE PERIOD of May through August 1948, an ecological survey and general collecting expedition, sponsored by the Provincial Museum and the University of British Columbia, was carried out on the Goose Islands and adjacent groups (approx. 51:50:30N., 128:20:04W.). The work was carried out by P. W. Martin, student of Zoology, University of British Columbia and myself.

Much of our time was spent in the twilight hours and throughout the night observing breeding pelagic birds and securing specimens of bats for the collections. However, no screech owls were heard or seen, and no indication of their occurrence in the area was observed until June 22. On this date we were collecting specimens of shore fishes in Gale Passage which separates Dufferin and Smyth Islands of the Bardswell group (approx. 52:10:00N., 128:20:00W.). In the late evening a screech owl was heard calling from the coniferous forest on the east side of Smyth. This bird responded twice to calls and then was silent. We were desirous of securing the specimen as only one published record existed for the species on the British Columbia coastal strip and islands north of Quatsino Sound on Vancouver Island. (1947 — Munro, J. A. and Cowan, I. McT., British Columbia Provincial Museum Special Publication No. 2, p. 127.) This record was obtained from the remains of a brood found in a settler's cabin in Jap Inlet on Porcher Island. (1923 — Brooks, A., Auk., 40:217-224.).

The following evening at twilight we proceeded by rowboat to a point off the shore where the owl had been heard. We successfully called up and collected an adult male Kennicott's screech owl *(Otus asio kennicotti)*.

On the Goose Island groups in the evening of June 27, two squawking notes of a screech owl were heard from the shore on the southeast side of the main island. Darkness prevented investigation that night, but two days later a breeding female was taken and a young bird heard. Another owl (the male probably) was observed perched on a beach log in the immediate area.

While engaged in avian population studies on the outer eastern islet of the group on June 28, we took another male by day on one of the plots. This bird was perched in a thick spruce. Not far from the perch, a tall snag with a hole about 40 feet up was obviously occupied, or had recently been so, which led us to believe that owls were also nesting on this islet. This was substantiated by Martin, who collected the female and two downy young on the night of June 30.

Two screech owls were also heard on the mainland near the mouth of the Koeyi River at dusk on August 1.

The above records substantiate that of Brooks for 1921 and serve to indicate that Kennicott's screech owl probably occurs more regularly along the northern British Columbia coastal strip and islands than existing records show.

The species is reported also from the Queen Charlotte Islands but as far as I am able to determine no specimen substantiates this report. Ronald Stewart (1947 — Personal communication), well known resident collector and active ornithologist of Masset, B.C., has neither seen nor heard one in eleven years of daily observation. The writer also, in eight months of intensive work upon the Queen Charlottes, did not observe the screech owl there.

Food habits of these coastal birds are of interest as observations indicate that their diet is supplemented by fish. In Victoria, B.C. on October 18, 1941, Mr. George Hardy of the Provincial Museum staff, (1948—Personal communication) observed a screech owl strike, with a splash, into a shallow artificial pond in which he kept goldfish. He collected this wet bird from a nearby tree to which it had flown. The crop contained only a species of Coleoptera. Mr. Hardy is of the opinion, however, that the unsuccessful strike was directed at one of the goldfish.

On Goose Island an adult was observed perched on a beached drift log intently watching the receding water line on a falling

[1]) Received for publication February 4, 1949.

Young Kennicot's screech owl and the rock blenny taken from its crop. Goose Island, B.C. June 30, 1948.

tide. From all appearances this bird was visually searching for food in the seaweed where species of blenny lie after the tide has fallen.

Crop analyses of the five specimens taken on the islands seem to tie in the above activities with fishing. In one immature bird was a complete rock blenny *(Xiphister mucosus)* some 5½ inches in length. One of the adults had the remains of small unidentified fishes in the crop (probably blenny). One crop was empty, the two remaining contained fragments of the following beetles: *Ceruchus striatus, Zacotus mathewsi, Plectrura spinicauda* and a species of *Pterostichus.*

PINNATED GROUSE ON MANITOULIN ISLAND [1]

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BETWEEN January 23 and February 9, 1949, opportunities were taken to watch the Pinnated Grouse, *Tympanuchus cupido* (Linnaeus), on Manitoulin Island whence it has been recorded previously by Baillie (1947, Sylva 3:pp. 2-3). They were extremely wild and unapproachable and it was only by using a telescope and glasses from a car that the birds could be studied at all.

Many of the farms have a hundred acres or so of sheep or cattle pasture which has a certain amount of scrub growth on it, and it is on this type of land where there are patches of juniper or sumac that the grouse feed.

They seemed to live in coveys of from six to nine which sometimes joined with other coveys to form small packs on the best feeding grounds. The largest numbers of grouse seen together were 23 on Barrie Isand and 21 on the Bluff west of Gore Bay.

By observing tracks in the snow and when possible watching the grouse, the main winter food at the end of January and beginning of February appeared to be juniper berries, supplemented by sumac, weed seeds and birch buds. They were frequently seen feeding high up in birch trees.

The coveys seemed to have a main or favourite feeding ground where they could usually be found in the mornings and early afternoons. If the birds were disturbed there, they usually flew off to one of their secondary feeding places.

The grouse appeared to feed on and off throughout the day with a slack period about midday. They could then be seen sitting under a juniper bush with their heads drawn down among their upper breast feathers, sleeping. Sometimes they dug for themselves shallow roosts in the snow about six inches deep.

On February 7 one was watched digging one of these resting places. With powerful kicks, it sent showers of snow flying out to the sides and behind. When it had dug deep enough, it settled down to rest with its back level with the surface of the snow.

Frequently, we came across these resting places, sometimes of one bird and occasionally where a covey had settled down about five or six yards apart. They were always placed in a position where there was a good uninterrupted view all round. In these loafing spots from six to nine droppings were usually to be found.

By three o'clock, the birds were usually to be seen feeding again, and they left the feeding grounds for their roosting places quite early. We never saw them feeding after four o'clock.

Between January 23 and 27, only about 4 inches of snow covered the ground and the grouse chose sheltered places in which to spend the night. One roost was at the base of a bushy cedar, two under dead stumps or fallen trees and four were under juniper bushes.

When the snow got deeper, all roosts found were dug into the snow, in the open away from cover except one which was among juniper bushes.

On January 28, 1949, at about 4:30 in the afternoon, a covey was surprised while going to roost. When approached, five, which had not dug themselves in, flew off; while the seven, which were beneath the snow, sat tight until the dog was within five or six yards. They then, one by one, exploded out of the snow in a most startling manner.

From the bird tracks at this roost, and at others examined, the following behaviour was deduced: the grouse flew direct to the roosting places and after landing, they walked three to ten yards, seldom farther, then proceeded to dig themselves in. A large hole indicated where they had entered the snow. They burrowed along some four inches beneath the crust for about two feet and here they spent the night as their pile of dropping showed. In the morning, they invariably flew direct from the roost, bursting out of the snow through the curst. (It is quite surprising the amount of droppings that the grouse leave in the roosts.)

The digestive processes of the Pinnated Grouse appear to be much the same as those of the Red Grouse, Lagopus scoticus (Latham), as described by E. A. Wilson in "The Grouse in Health and in Disease."

[1]) Received for publication March 10, 1949.

The great bulk of the droppings found in the roosts are hard and dry containing the woody parts and indigestible fibers of the food. Before the birds leave the roost in the early hours of the morning, three or more large, soft, cæcal droppings are discharged. Occasionally, this cæcal waste is absent from the roost and is expelled after the bird has left.

Digestion must be quite fast as the number of droppings at a roost averaged 45 with some cæcal waste. The highest number counted was 61 hard and 8 cæcal droppings after a night and morning of storm.

MYOTIS LUCIFUGUS LUCIFUGUS MISTAKEN FOR MYOTIS KEENII SEPTENTRIONALIS [1]

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BATS of several species found in eastern Canada resemble each other so closely that identification is difficult. It is therefore not strange that errors are made occasionally in the literature dealing with them. The purpose of this note is to call attention to two instances where the common little brown bat, *Myotis lucifugus lucifugus* (LeConte), has been mistaken for the eastern long-eared brown bat, *Myotis keenii septentrionalis* (Trouessart). The common little brown bat is much more numerous than its long-eared relative, and in the summer forms colonies in the attics and walls of buildings. These colonies are often of several hundred individuals, almost exclusively females and young. The long-eared brown bat, though widespread, is not as numerous as the common little brown bat, and apparently selects less sheltered spots than attics and wall partitions during the summer. Hamilton ('43) describes a few roosting behind the shutters of a cottage in New York, and states that they may form colonies of a dozen or more under loose bark, in caves, or behind window blinds.

In a note on the bat bedbug, *Cimex pilosellus* Horv., Stirrett ('35) described a colony of about two hundred bats in the attic of a dwelling near Chatham, Ontario, referring to the bats as *Myotis keenii septentrionalis*. In 1939 I visited this colony and found it to be of *Myotis l. lucifugus*. Inquiry at the National Museum of Canada revealed that specimens from this colony had originally been wrongly determined, Dr. R. M. Anderson later assigning them to *Myotis l. lucifugus*.

In Gibson and Twinn's ('39) excellent booklet on household insects a few vertebrate animals that become household pests are discussed. It is stated that bats often establish themselves in the attics and walls of dwellings, and a drawing of a "long-eared brown bat" clinging to boards is shown. Here, presumably, the common little brown bat was again mistaken for the long-eared species. The drawing, incidentally, appears to be of the common little brown bat.

Another species is sometimes confused with the little brown bat because of its preference for buildings. It is the big brown bat, *Eptesicus fuscus fuscus* (Beauvois). Its colonies are usually smaller than those of the little brown bat, but are in the same sort of locations. It is the only bat in eastern Canada found in buildings throughout the year. Its larger wingspread of about a foot, compared with a spread of nine or ten inches in *Myotis*, distinguishes it from the smaller species.

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[1] Received for publication January 10, 1949.

A NEW FOSSIL LOCALITY IN THE LOWER CAMBRIAN MONKTON FORMATION OF VERMONT [1]

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IT IS ONLY of recent date that the first fossils collected from the lower Cambrian Monkton quartzite of Vermont were uncovered. These were described, figured, and the locality placed on a map (Kindle and Tasch, 1948). Subsequently, a second locality was found by J. L. Wilson of Yale University (Fig. 1). The fossils which he collected were sent to the writer for description. The finding of a new locality advances the possibility of ultimately establishing faunal zonation of the Monkton formation.

Locality II is about one third mile northeast of Locality I. The original fauna were found near the bottom of the Monkton whereas the most recent collection comes from near the top of the formation.

The rock material was characteristically deeply brown weathered. There were no complete trilobite individuals. Only cephala were present. The dominant species, in terms of number of individual cephalons, was the trilobite, *Antagmus adamsi*. Of the cephala, twenty belonged to *A. adamsi* and three to *A. typicalis*.

A comparison of the faunal lists of the two localities within the Monkton highlights some differences of interest that may prove to have utility in zonation.

The following observations are suggestive of changing conditions of life apparently favorable to certain forms and not to others: the complete absence of olenellids or of any fragment of that group; the complete absence of *Bonnia*, the cephala and pygidia of which group were abundant at Locality I; the occurrence of two species of *Antagmus*, which at locality I, were often found on the same slab as the olenellids; the rarity of brachiopod species noted at locality I and more pronounced at locality II.

More importantly, the differences in faunal assemblages noted, allow a tentative

[1]) Received for publication April 14, 1949.

Table 1

FAUNAL LIST

	Locality I	Locality II
TRILOBITES		
Olenellus vermontanus (Hall)	x	
Olenellus thompsoni (Hall)	x	
Olenellus hermani Kindle and Tasch	x	
Olenellus, sp. undet.	x	
Antagmus adamsi (Billings)	x	x
Antagmus typicalis Resser	x	x
Bonnia swantonensis Resser	x	
BRACHIOPODS		
Kutorgina cingulata (Billings)	x	
Nisusia festinata (Billings)	x	?
Paterina cf. *swantonensis* Walcott	x	
Acrotreta, sp. undet.	x	
GASTROPODS, ETC.		
Helcionella, sp. undet.	x	
Hyolithes, sp. undet.	x	x
Scolithus	x	

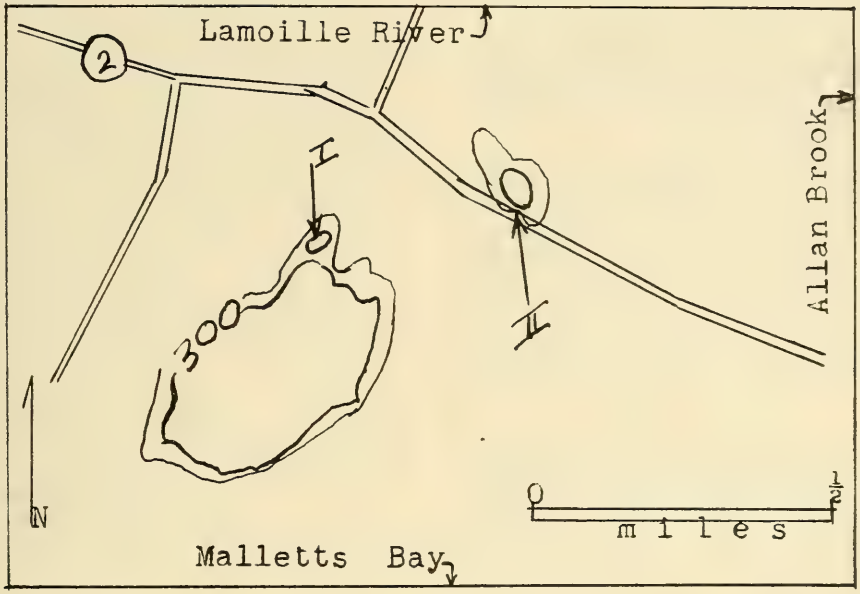

Fig. 1. Lower Cambrian Monkton formation of Vermont. Figures indicate the two fossil localities. Only contour lines immediately relevant are shown all others are amitted. Cf. Kindle and Tasch, Can. Field-Nat. Vol. 62, No. 5, fig. 1, p. 134.

zonation of the Monkton as follows: lower Monkton characterized by olenellids, *Bonnia,* and *Antagmus;* middle to top of the Monkton characterized by *Antagmus adamsi.* No certainty can be attached to the suggested zonation until more localities are uncovered within the Monkton along its entire exposure and the fossils described. However, it can serve as a useful frame of reference to be modified as new evidence comes in.

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NOTES AND OBSERVATIONS

Occurrence of the Ring-necked Duck in Newfoundland. — The Ring-necked Duck *(Aythya collaris)* appears to be a common breeding summer resident of Gander, Newfoundland, and this north-easterly extension of its range is worthy of record.

My first observation of this species at Gander on May 8, 1948, coincided with the first breaking up of the ponds in this area. These ponds were not entirely free of ice until two weeks later.

Two pairs raised broods in Caledonia Pond, scarcely three hundred yards from my residence, and concentrations of unattached males, as many as seventeen, were observed there during early July. A visit on June 19 to another small pond and a series of gullies within two miles of this specific area revealed a total of five females and six males.

The first brood of nine downies appeared in Caledonia Pond on July 31, and on the following day an additional female brought out a brood of eight. A downy was collected on August 1, and is now in the Newfoundland collection of the U.S. National Museum, where its identification has been confirmed by Dr. J. W. Aldrich.

Caledonia Pond lies at an elevation of 450 feet and contains an area of approximately one quarter square mile. It can best be described as a boggy pond with a "floating-bog" type of shoreline. It is nearly surrounded by a fringe of tall conifers. A beaver dam at the pond's outlet maintains the water at a constant level, which at its deepest areas is not quite six feet. Very

little emergent vegetation appeared before the middle of June, but by the end of July the pond was nearly filled with a protective cover of reeds, sedges, and such buoyant aquatics as yellow pond lilies, sweet water lilies and pondweed.

Highroads pass quite closely on the eastern and northern sides. Two boats for fishing and swimming purposes are kept there. It is in a direct line with one of the main strips of the runway, and aircraft continuously pass over it at an altitude of three hundred feet. In brief, there is considerable disturbance of the pond during the summer season.

The proximity of Caledonia Pond to my residence afforded me many opportunities, usually early morning and late evening, to take notes of the occurrence of the Ring-necked Duck in this particular locality. Therefore, the following tabulation of observations of this species at Caledonia Pond during 1948 might be of interest:

May 8 — 1 ♀; 4 ♂♂
May 11 — 2 ♀♀; 2 ♂♂
May 12 — 1 pair
May 14 — 2 ♀♀; 5 ♂♂
May 15 — 1 pair
May 17 — 1 pair
May 23 — 2 pairs
May 30 — 2 pairs
June 2 — 3 pairs
June 4 — 3 pairs
June 9 — 2 pairs
June 12 — 2 prs.; 3 ♂♂
June 13 — 2 prs.; 3 ♂♂
June 16 — 2 prs.; 4 ♂♂
June 17 — 2 prs.; 1 ♂
June 23 — 2 prs.; 9 ♂♂
June 24 — 2 prs.; 5 ♂♂
June 26 — 2 prs.; 5 ♂♂
June 28 — 2 prs.; 12 ♂♂
June 29 — 2 prs.; 7 ♂♂
June 30 — 2 prs.; 10 ♂♂
July 3 — Females not in evidence; 17 ♂♂
July 8 — Females not in evidence; 15 ♂♂
July 15 — Females not in evidence; Males had departed
July 30 — 1 ♀; 9 young
Aug. 1 — 2 ♀♀ ; 17 young

Observations of the two females and seventeen juveniles up to September 8 revealed that no casualties were apparent — although there was Horned Owl nested nearby — and that the young had not attempted flight up to that date. The next check was on September 16, the day following open season for ducks in this area, and only one female and three juveniles were observed in the pond. No concentration of unattached males was observed in Caledonia Pond after July 8, and the final observation for the year of this species was on October 11, when five were seen in a nearby gully.

Apart from two broods of Ring-necked Ducks, a Black Duck brought out a brood of ten in Caledonia Pond. A Bittern nested on its bank and the Golden-eye and American Coot visited it in migration.

The interior of Newfoundland is relatively little known and abounds with ponds of a similar type. Although this is the first record of the occurrence of the Ring-necked Duck in this province, there is no obvious reason why its establishment in the interior may not actually be quite widespread. — LESLIE M. TUCK, Caledonia Camp, Gander, Newfoundland.

A STELLER'S JAY NEST INSIDE A BUILDING.—My notes on the nesting habits of Steller's Jay (*Cyanocitta stelleri*) in the southern interior of British Columbia show that of twelve nests recorded, all but one were in evergreen trees at heights ranging from six to thirty feet. The exception was found on July 3, 1946, at a logging camp near Bolean Lake, B.C.; it was a particularly large nest almost covering the top of a wooden box nailed to the inner wall of a privy, about seven feet from the open doorway and five feet from the ground. It contained three nestlings about two weeks old, and an addled egg.

Although the camp had been vacant for a period extending from the previous autumn until a few days prior to my visit, the parent birds seemed to have already accustomed themselves to the presence of humans and evinced no concern over visits to their nursery or the clamor of the power saws just outside.

A possible explanation of this unusual nest site[1] may be that wintry conditions prevail at this elevation (5000 feet) until well after the breeding season has begun, and the shelter may have appeared attractive to the jays faced with the prospect of nesting while still subject to occasional snowstorms. All other nests I have recorded were at elevations of between 2000 and 3000 feet.—JAMES GRANT, Forest Insect Field Station, SEEBE, Alberta.

[1]) Similar sites are recorded by Bent (1946, U.S. National Museum, Bull. 191, pp. 58 and 67) from Seattle, Washington, and Placer County, California. — Ornith, Ed.

Red-fruited form of Acer Negundo L.[1] — This distinctive form of *Acer Negundo* L. was first called to my attention by Mr. L. T. Owens of Toronto. It had been collected by a friend of his at Campbellford, Ontario. Since then it has been discovered growing near Ottawa and I believe the red-colored fruit makes it worthy of separation from the typical green-colored fruit of *Acer Negundo* L.

Acer Negundo L. forma *sanguineum* f.n. sameris immaturis coloratis sanguineis bubalis (Hort. Color Chart II, No. 00823/3) post viridibus.

Immature samaras colored oxblood red (Hort. Color Chart II, No. 00823/3) becoming green. All the material examined had well-developed samaras but no seed.

Type: on the side of road near temporary creek, mucky ground, about 11 mi. west of Ottawa on Highway 17, March Twp., Carleton Co., May 31, 1949, W. G. Dore, 9802 (in the Herbarium of the Division of Botany and Plant Pathology, Science Service, Dept. of Agriculture, Ottawa).

MATERIAL EXAMINED: same locality as above, June 17, 1949, W. G. Dore and M. L. Martin, 9855 (D.A.O. Herbarium); near Kesioick, at the side of the Lake Shore Road (Lake Simcoe), May 29, 1949, L. T. Owens (D.A.O. Herbarium): in yards and along fence-rows, 5 mi. south of Campbellford, Ont., Percy Boom Tourist Camp, Northumberland Co., July 13, 1948, W. G. Dore and G. L. Church, 8653 (D.A.O. Herb.) —LUCILLE MARTIN, Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa.

[1]) Contribution No. 991 from the Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa, Canada.

Large Fish Killed by Merganser.—Mr. J. A. Summers, Fisheries Inspector, reports that during the cold spell an American merganser was observed to kill a 12-inch coast cutthroat trout in an unexpected way. The duck was standing in an open riffle in Nanoose creek, Vancouver Island, when it quickly threw the fish out on the ice, followed it there and killed it with blows of its beak.—J. L. HART, Pacific Biological Station, Nanaimo, B.C.

REVIEW

EUROPEAN STUDIES OF THE POPULATIONS OF MARINE FISHES

By J. R. Dymond. Contributions of the Royal Ontario Museum of Zoology No. 30, 1948. Reprinted from the Bulletin of the Bingham Oceanographic Collection Vol. XI Art. 4 May 1948, P. 55-80.

This paper is one of a series presented at a symposium on fish populations held in Toronto in 1947. In it Professor Dymond has presented an excellent review of the more recent developments in the study of populations of fish of commercial species in European waters. Much of the work has been carried on in Great Britain and the Scandinavian Countries. The economic importance of the fisheries to these countries is considerable.

Wide fluctuations in abundance from year to year appear characteristic of natural populations of fish and in most important commercial species the members of some year classes may be fifty to sixty times as abundant as the members of others. Changes in hydrographic conditions may affect the availability of fish to the fisherman even though the abundance is unchanged. Wide fluctuations in numbers appear to be characteristic of the fauna of the sea bottom also.

The work of the International Council for the Exploration of the Sea is discussed and the contribution of this organization to the progress of population studies, particularly in regard to the overfishing problem and increased mortality caused by fishing, is discussed.

Overfishing, "the state in which the more you fish the less you catch" is discussed as is the rate of growth of fish in relation to density of population. A desirable rate of production is suggested as that in which fish are removed quickly enough to permit the rapid growth of succeeding generations in uncrowded conditions, but not so quickly that

the fish have not time to reach a suitable size before capture. Up to a point, the yield can be increased by increasing fishing, but after the maximum has been reached, increased fishing produces a less weight of fish or "overfishing".

Recognition and description of local races which have separate spawning areas and average differences in certain morphological characters has formed an important link in the studies of populations.

Analysis of age and certain life history information of fish by means of scale examination has formed a basic part of population study. Statistics of commercial fisheries over long periods have proven useful in population studies. Studies based on tagging and racial investigations have shown that migration of fish usually has less effect on availability than actual changes in abundance of fish.

An understanding of population dynamics has now reached the stage where predictions of abundance, but not necessarily of availability may be made with considerable success.

A bibliography of 85 titles forms a valuable addition to the text of the paper.—VICTOR E. F. SOLMAN.

HANDBOOK OF FROGS AND TOADS OF THE UNITED STATES AND CANADA

By Albert Hazen Wright, Professor of Zoology, Emeritus, Cornell University, and Anna Allen Wright. Third Edition. The Comstock Publishing Company, Inc., Ithaca, New York, 1949: 640 pp., 126 pls., 7 figs., 37 maps. $6.50.

The first edition was a pocket handbook, the second edition was considerably enlarged, and now, to incorporate new text, maps and illustrations, the third edition has 354 more pages than the second.

This publication consists of a general account, keys to families, accounts of the one hundred and two species and subspecies inhabiting the United States and Canada, a very complete bibliography, and the index. Fifteen plates each containing eight to fifty-eight photographs or drawings illustrate vocal sacs, sex characters, eggs, tadpoles, and development. One hundred and eleven plates each consisting of several views illustrate the individual accounts. These illustrations are mainly reproductions of hundreds of photographs of living specimens nearly all photographed by the authors. The seven figures each comprised of several neat drawings clearly present a great number of physical characters. The thirty-seven maps introduced in this edition indicate life zones, rainfall, and ranges.

Like those south of the border, the approximate ranges of the frogs and toads occurring in Canada are indicated on the maps, and the account of each covers common and scientific names, general appearance, structure, size, colour, voice, reproduction and habitat. We learn that frogs seem to have habitat preferences influenced by geological conditions controlling the mineral concentrations of the breeding waters. The smallest vertebrate of North America is a frog less than one-half inch in body length, and the eggs in a complement of one variety of toad may number 16,000, and in that of a bull-frog 20,000. The eggs of some species float on the surface of the water, while those of other species remain submerged.

The authors must feel contented with their splendid accomplishment representing inestimable months and years of study, writing and patient photography, and the owner of a copy of the book should feel elated to possess this complete word and picture coverage of the subject.

Handbook of Frogs and Toads should be in the library of every institution teaching natural history or agriculture, and in the possession of every person interested in wildlife.—CLYDE L. PATCH.

1947 ANNUAL REPORT OF THE PROVANCHER SOCIETY OF NATURAL HISTORY

Included in this report is a statement of the activities of the Society for the year by the Secretary, Mr. G. A. Leclerc, and a number of papers by other authors. Carl Faessler discusses the maximum extension of the Champlain Sea to the north of the St. Lawrence; Carl W. Buchheister, National Audubon Society, writes on the Arctic tern; Stuart L. Thompson pays tribute to "Taverner, the Naturalist". Of particular interest is an English translation of an article published in 1940 on the history of the bird sanctuaries of the Society—C. FRANKTON.

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THE BIRDS OF THE YORKTON DISTRICT, SASKATCHEWAN [1]

C. Stuart Houston
Yorkton, Sask.

INTRODUCTION

The Area

THE AREA covered by this list extends from Yorkton roughly forty miles in each direction, though the borders are varied slightly to conform with topographical and faunal limits. They are shortened to the north, to avoid southward projections of coniferous areas, and to the south to avoid the distinctive features of the Qu'Appelle Valley. They are extended to the west to include Ituna and Sheho.

The district lies at the northern edge of, but wholly within, the Transition Life Zone, in the "parklands" or "aspen-prairie" belt. Projections southward of the Canadian Life Zone come in close proximity to the northern edge of this district in the vicinity of Madge and Crystal Lakes.

The terrain is undulating in nature, with the elevation varying from 1445 ft. above sea level at Kamsack to over 2200 ft. in the Beaver Hills. Most of the district drains into the Assiniboine River, via the White-sand River and smaller tributaries. South of Ituna, Melville, and Bredenbury, however, drainage is south into the Qu'Appelle Valley.

This area is now a fertile agricultural district, devoted largely to grain and dairy farming. Originally less than one-quarter of the district, chiefly the southern part, was predominantly open "prairie". The remainder was at least half wooded, with large areas, as in the Beaver Hills, nearly entirely treed. Today, from the air, one gains the impression that approximately half the area is about half wooded, and that one-quarter is even more densely treed.

The wooded areas consist almost entirely of poplars — black (balsam) poplar in the lower, damper locations, and white poplar (aspen) on the higher ground. Willows of various species occur throughout the district, and chokecherry, saskatoons, and other shrubs are in profusion. There are a few small natural groves of Manitoba maple in the district.

The district is dotted with small sloughs of every size, many of which dry up as the summer advances. However, with the numerous small lakes, and deeper ponds and sloughs and, lately, the 12-ft. deep farm "dugouts", the majority of duck broods are within reach of water in the average year.

The Upper and Lower Rousay Lakes are normally shallow (not over 4 to 5 ft. deep), with wide margins of grasses and rushes affording excellent cover along the sides of the open water. Crescent Lake and York Lake are deeper (up to 20 ft. deep) and more open, with narrower margins of rushes. The Crescent and Rokeby Marshes possess dense, almost impenetrable stands of high grasses and rushes, and only very small patches of open water. Leech Lake is a shallow, desolate lake, with grasses and rushes growing over the major part of it. Good Spirit Lake, locally known as "Devil's Lake", is a large, deep lake with extremely wide sandy beaches. The "Muskeg" and "Hopkins Lake", situated in the ravine which forms the western city limits of Yorkton, are small, pretty, spring-fed bodies of water, lined with stands of bulrush and cattail.

All these lakes vary greatly in size and depth over the years as wet and dry periods alternate. 1882 was a year of extremely high water levels, but by the early 1890's, many lakes were dry and others held only small amounts of water. However, with the aid of a few wet years at the turn of the century, water levels were back to normal by 1902. In the early 1920's, water levels were up as much as ten feet, and fish abounded in the streams and lakes. In 1937, Leech and Lower Rousay Lakes were dry again, though

[1]) Originally received for publication September 16, 1947, subsequently revised and amended.

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generally water conditions were not as serious as in the dry years of the 1890's. Water levels for the last few years have been average. The levels of both the Rousay Lakes and York Lake are now maintained and regulated by a diversion ditch from Willowbrook Creek and strategically located dams — the work of Ducks Unlimited.

The nearest local bird lists would seem to be for Nipawin, where Street (1943 and 1946) has recorded 211 species; for Emma Lake, where Mowat (1947) published a list of 156 species; and for the Lake St. Martin Region, Manitoba, where Shortt and Waller (1937) published a list of 215 species. Our area differs from theirs, however, inasmuch as it is exclusively within the Transition Life Zone.

Treatment and Terms

As there are no collections of skins from this district available for subspecific determination, I have deemed it wise to confine myself to binominal terminology.

Spring migration dates were compiled from two main sources: The records of the late Isabel M. Priestly for the years 1936 to 1946, and those of William Niven, for the years 1939 to 1947. Records of the author, for the years 1939 to the present, and of A. McPherson, for 1945, also were used. From these sources, the earliest date for each year was tabulated and from this the earliest arrival of any year, and the average date of arrival, were calculated. I have observed that, on the average, there is little or no discrepancy between Yorkton and Sheho arrival dates for most species. When Mr. Niven has recorded the earliest date of arrival for the district, this is denoted by the bracketed initials (W.N.). Fall departure dates are much more difficult to obtain than those of spring arrival. Such dates as we have are chiefly from the records of Mrs. Priestly, together with a few of the writer's.

In the future, more attention should be given to determining the date when a species becomes common, not just to the date when the first member of the vanguard arrives. Considerable attention must also be devoted to nesting records, particularly those of our song birds.

The relative abundance of any particular species is largely a matter of personal opinion. Yet I feel that by obtaining the agreement of Judge McKim, Mr. Niven, Mr. Baines and myself, dispersed as we are at four separated points, that personal prejudices and misjudgments should largely have been ruled out.

Acknowledgements

My greatest debt is to the late Mrs. Isabel M. Priestly. It was she who initiated me into the fellowship of the Great Outdoors. From the early hikes of childhood to later collaboration on "The Blue Jay", she it was who guided my way, directed my energies, corrected my mistakes, and encouraged any small successes.

Mrs. Isabel M. Priestly, nee Isabel M. Adnams, was born July 23, 1893, in Newbury, Berks, England, and died on April 23, 1946. Previous to her marriage to Robert J. Priestly, a Canadian soldier, in 1918, she had been studying for a botanical research degree, and had studied botany in England, Germany and Switzerland. Following residence in Calgary and Winnipeg, she moved to Yorkton in the summer of 1935. For several years, together with H. S. Swallow, she conducted a nature column in the Yorkton Enterprise. Many of her observations appeared also in the Winnipeg Free Press bird column, "Chickadee Notes." In July, 1942, she compiled a 5-page, briefly annotated, mimeographed "List of the Birds Identified in the Yorkton District in Recent Years." Her list, containing definite records for 193 species, with the status of six additional species listed as "uncertain", has formed the framework for this present list.

In September, 1942, through her inspiration, the Yorkton Natural History Society was formed, and she became the first president of the new organization. The Society immediately undertook the quarterly publication of a mimeographed bulletin on the wildlife of the province, known as "The Blue Jay", and Mrs. Priestly became its editor. The credit for the success of "The Blue Jay" belongs entirely to Mrs. Priestly: her fresh, newsy style made it readable and interesting; her ability to collect and organize facts made it of scientific interest and importance; her enthusiasm made it a medium for the exchange of observations which proved stimulating to amateur and professional alike.

It was her intention to revise her previous list for this district during the summer of 1946, had not the Grim Reaper kept her from the task. I feel this present list is merely an attempt to take up the work from where

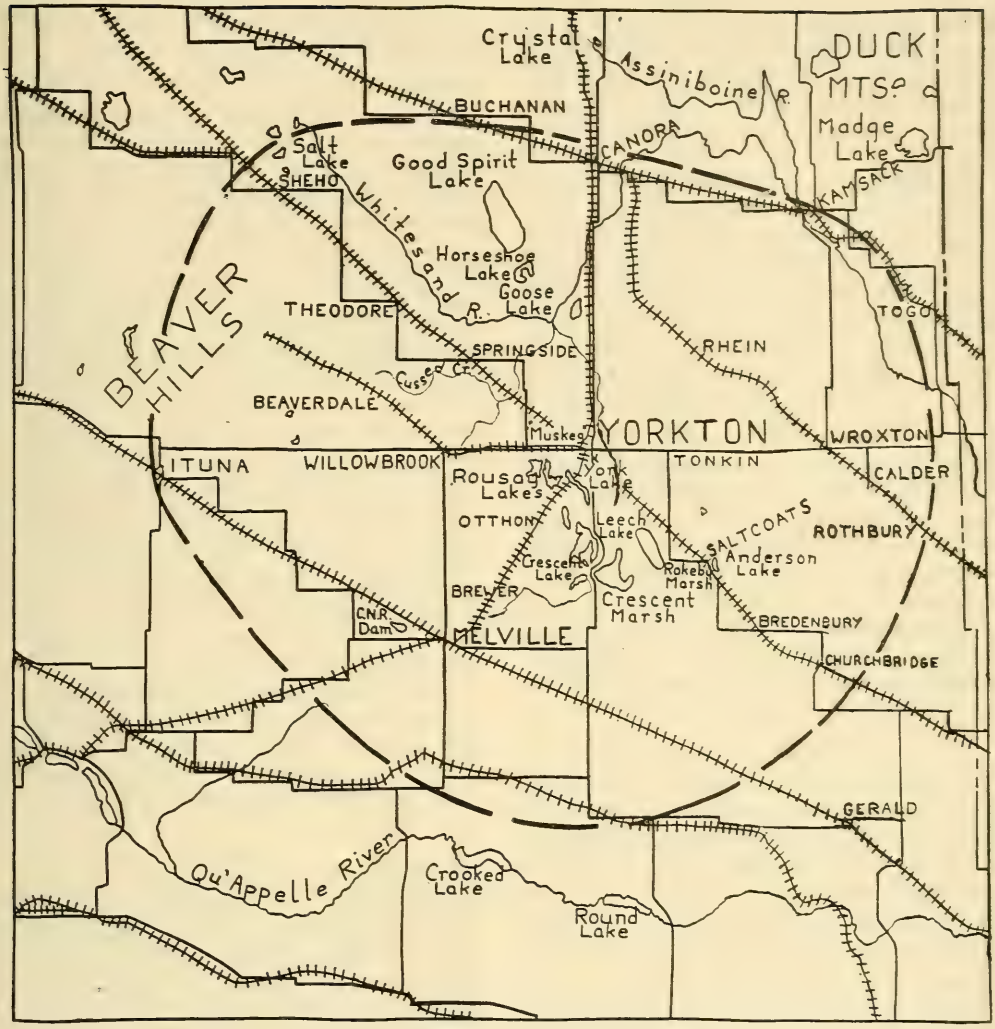

Fig. 1. Map of the Yorkton District, Saskatchewan.

she left it. Without the fruits of her labor, it would never have been started; without her enthusiasm the various observers would never have been brought together, and without her inspiration I would never have essayed so large a task. To her must go the large share of credit for the list hereby submitted.

Unless otherwise stated, all Melville records were contributed by His Honour, Judge Louis T. McKim, now of Melfort, Saskatchewan, whose Melville migration records cover each year between 1922 and 1945; all Sheho records are those of Mr. William Niven whose continuous migration records extend back to 1939, and sporadically over a much longer period; all Crescent Lake and Crescent Marsh records are those of Mr. Frank Baines, Saltcoats, who with his brother Fred, settled as a boy at Crescent City, some 18 miles south of the present city of Yorkton in 1883; and all Good Spirit Lake records were furnished by the late J. A. Gunn who, until his death in 1947, kept migration records for many years.

Particularly valuable also have been the records of Messrs. R. P. Rooke, J. H. Wilson, W. H. Carrick, and A. McPherson.

In addition to the Yorkton data of Mrs. Priestly and the writer, other records have been contributed from time to time by various members of the Yorkton Natural History Society including J. R. Foreman, Ethel Lloyd, C. C. Shaw, Brother Clarence, H. S.

Swallow, Sgt. A. E. Smith, Jim Smith, Jim Rogerson, Fred Langstaff, John Smith, W. D. Lightbody, W. A. Tripp, Vernon S. Barnes, Brother S. Matthias (now of Montreal) and C. Stuart Francis (now of Torch River, Sask.).

I am indebted also to Brian Bjarnason, of Vancouver, who did the preliminary work necessary in the compilation and tabulation of Mrs. Priestly's records; to Miss Yvonne Duncan who prepared the map showing localities mentioned in the text; and to Mr. C. C. Shaw for the habitat photographs.

The preliminary draft of this list was checked by His Honour, Judge Louis T. McKim; William Niven; Frank Baines; John A. Gunn; and W. H. Carrick. All gave their opinions concerning relative abundance of each species and added details of all records they had concerning the less numerous species. Their kind assistance has greatly enhanced the value of this list. My gratitude for critical comment is due to Maurice G. Street of Nipawin, and more especially, to W. Earl Godfrey of the National Museum of Canada.

LIST OF SPECIES

The following list for the Yorkton district contains 231 species definitely identified, plus 8 listed as hypothetical. This may be compared with the Provincial list totalling, as recorded by Mitchell (1924), with Potter's additions (1943), some 294 species definitely identified, plus 14 hypothetical species.

Common Loon.

Gavia immer. — Fairly common summer resident on some of the larger and quieter sloughs and lakes. Commoner at Crescent Lake when fish were plentiful there. Now usually noted only as a transient at Sheho. Earliest spring arrival, April 24, 1940. Average, April 29. Latest fall departure, Oct. 27, 1943. Two newly-hatched young in nest at the "Muskeg", June 10, 1947.

Holboell's Grebe.

Colymbus grisegena.—Fairly common summer resident on larger sloughs and lakes. Commoner at Crescent Lake when fish were plentiful there. Earliest spring arrival, April 29, 1944 and 1946. Average, May 3. Early nest near Crescent Lake, June 8, 1943 (I.M.P.)

Horned Grebe.

Colymbus auritus.—Common summer resident on sloughs. Earliest spring arrival, April 30 (W.N.). Average, May 6. Early nest, 2 eggs, June 1, 1946. Early hatching, June 20, 1946.

Eared Grebe.

Colymbus nigricollis. — Common summer resident on most of the larger bodies of water, though I have few migration dates for this species. Earliest spring arrival, May 2, 1945. Early nesting, June 7, 1946.

Western Grebe.

Aechmophorus occidentalis.—Not common; noted chiefly in migration. A few mid-summer records indicate the possibility that a few pairs may remain to breed. L. T. McKim reports that they are present in good numbers all summer at Crooked Lake, just south of the area covered by this list. Earliest spring arrival, May 1, 1938. Average, (of 3), May 5. Pair noted on the "Muskeg", June 10, 1947. A single bird at Rousay Lake, July 5, 1943. An individual of this species was found by Wm. Yaremchuk on Sept. 15, 1944, in Yorkton after a heavy storm.

Pied-billed Grebe.

Podilymbus podiceps. — Regular, but not common, summer resident on marshy ponds and sloughs. Earliest spring arrival, May 6, 1942. Average, May 9. Latest fall departure, Sept. 28, 1942 and 1944. Average (of 3), Sept. 27.

White Pelican.

Pelecanus erythrorhynchos. — Not uncommon in migration. Earliest spring arrival, April 18, 1942. Average, May 2. Latest fall departure, Oct. 26, 1942. Varying numbers of this species make sporadic visits of one and two days duration throughout the summer. These are probably usually wandering, nonmated birds.

Double-crested Cormorant.

Phalacrocorax auritus. — Uncommon in spring migration. Earliest spring arrival, April 17, 1943 (W.N.). Average, April 30. One fall date: Sept. 26, 1941, at the "Muskeg". An individual or two was present each summer at Good Spirit Lake until about 1922. A cormorant banded July 16, 1935, at Dafoe, Sask., by Fred C. Bard, was picked up dead at Good Spirit Lake by John A. Gunn, Aug. 15, 1938.

Great Blue Heron.

Ardea herodias.—Uncommon summer resident. Mr. Niven has only one record for Sheho: three birds noted May 28, 1943. A small colony of two nests, which contained young, was located in a dead balsam poplar at

Leech Lake, on July 25, 1944. (Heronries of this species are located also at Crooked and Round Lakes in the Qu'Appelle Valley, just south of the district covered by this list).

American Egret.

Casmerodius albus. — Accidental. An individual was noted by Mr. Frank Baines, Oct. 27, 1941, as it sought to obtain food in the farmyard of Mr. Gilbert Hulston, sec. 24, twp. 23, range 3, west 2nd mer., near Crescent Lake. The bird was in such a weakened and emaciated condition that it could not even hold its own among the domestic turkeys. It is now mounted and in the private collection of Mickey Nolan, now residing near Whitehorse, Yukon.

Black-crowned Night Heron.

Nycticorax nycticorax. — Noted frequently at York, Leech, and Crescent Lakes, the C.N.R. Dam at Melville, the "Muskeg" and along the Little Whitesand River. As far as is known, these birds all originate from the Rousay Lake heronry. For Sheho, where it is an irregular migrant, Mr. Niven has three spring dates: April 15, 1942, April 30, 1939 and May 16, 1943. The earliest Yorkton date is May 13, 1946. I doubt that the majority arrive before the first or second week in May. I have only two fall dates: Sept. 11, 1942 and Sept. 12, 1943. Several hundred rested at Good Spirit Lake in the fall of 1922, the only time J. A. Gunn ever saw this species.

E. S. Wood reports that about 1934, "thousands" of Night Herons nested in a large bush on the island in the channel between Upper and Lower Rousay Lakes. Nearly every tree was occupied at that time, and many contained 3, 4 and 5 nests. In 1944 there was a heronry of about 30 nests, located on a smaller island on the west side of Upper Rousay Lake. The nests were built partly in willows, but chiefly in black (balsam) poplar, from 5 to 20 ft. above the ground. All signs pointed to this being a very recent location for the colony, and the following year it was deserted. In 1946, the herons were found nesting among the bulrushes at Lower Rousay Lake, in 4 different groups, with a total of 21 nests. These nests were located in 15 to 20 inches of water, extended 10 to 12 inches above water level, and consisted of masses of rushes, with no other lining. Due to high water levels which flooded the bulrushes in 1947, the herons returned to take up residence on the island they had occupied in 1944. This time there were only 13 nests, built rather precariously in the tops of chokecherry bushes.

Early nests with 3 eggs; 2 eggs; and 1 egg on May 26, 1946, had 4 young birds; 3 young; and 1 young and 3 eggs, respectively, on June 19, 1946, indicating an incubation period of 22-24 days.

American Bittern.

Botaurus lentiginosus. — Fairly common summer resident of marshes. Considerably decreased in numbers during the dry years of the 1930's. Earliest spring arrival, April 30, 1939. Average, May 8. Latest fall departure, Sept. 28, 1942. Early nest, 5 eggs, June 24, 1946. Early hatching, July 1, 1946. A young bittern, still too young to fly, was caught at Rousay Lake, Sept. 12, 1943.

Whistling Swan.

Cygnus columbianus.—Regular spring and fall migrant, stopping over on the larger bodies of water. Two birds once spent a summer in the Crescent Marsh, north of Frank Baines' farm, in the 1920's. Earliest spring arrival, April 10, 1946 (W.N.). Average, April 21. Latest spring departure, 5 birds, Leech Lake, May 27, 1945 (W. H. Carrick). Earliest fall arrival, Oct. 9, 1942. Latest fall departure, Nov. 11, 1944.

Canada Goose.

Branta canadensis.—Common in migration. A number of pairs remain to breed on the Rousay Lakes, Rokeby Marsh, Crescent Marsh, and at several lakes north of Sheho. Earliest spring arrival, March 19, 1945. Average, March 29. Latest fall departure, Nov. 2, 1944. Average, Oct. 29. Early hatching, May 14, 1946 at Upper Rousay Lake; May 15, 1946 at Rokeby Marsh. Goslings from the former nest took their first short flights almost exactly two months later. Late nesting, 6 eggs, June 22, 1947.

White-fronted Goose.

Anser albifrons. — Thousands stopped in migration at Crescent Marsh each year around the turn of the century. A flock rested on Good Spirit Lake in the fall of 1938. Hundreds were noted at Leech Lake during the fall of 1944 and October, 1945, and during the last part of April, 1945.

Snow Goose.

Chen hyperborea. — Uncommon transient. R. P. Rooke reports that large flocks flew over Rothbury settlement each spring in the 1890's. Frank Baines reports that he noted small flocks in migration each year prior to 1942, the last time he saw any. Two or three

in a flock of small Canada Geese, in the early 1900's, constituted J. Gunn's only record for Good Spirit Lake. Mrs. M. J. Culver reported a flight over Yorkton, April 27, 1939. Mr. Niven's sole record for Sheho is for a single bird, flying high with a flock of small Canada Geese, April 12, 1943.

Blue Goose.

Chen caerulescens. — Rare migrant. C. Stuart Francis, now of Torch River, saw a pair of this species with a small flock of Canada Geese, in the spring of 1923, on the farm of Frank Maddaford, 8 miles west of Saltcoats. They fed on the stubble field for two or three hours, while he drove a four-horse team, plowing, up and down the field within 100 yards of the geese. Five were noted at Crescent Lake by C. H. Maddaford, May 7, 1938. J. Gunn noted one flock on Good Spirit Lake sometime during the 1930's.

Mallard.

Anas platyrhynchos. — Very common summer resident. Earliest spring arrival, March 23, 1945 (W.N.). Average, April 6. Late fall departures, Nov. 7, 1943 and Nov. 11, 1944. Early nest, 9 eggs, May 8, 1946. Early hatching, May 22, 1946. A female was found nesting in 1946, 3 miles south of Yorkton, in a nest known to have been occupied by a Magpie the previous year.

The nest was about 12 feet above the ground in willows, and as Cliff Shaw and the writer arrived on May 23, 1946, the nine downy young were just jumping from the nest, the mother quacking anxiously on the ground nearby. The light, downy young fell rather slowly, bouncing off several small branches during their descent. Immediately on hitting the ground, they jumped up and ran into the underbrush, apparently none the worse for their experience. This nest was again occupied with success by a Mallard in 1947. Another Mallard was found nesting in a black poplar some 18 feet from the ground at the "Muskeg", on June 10, 1947.

Black Duck.

Anas rubripes. — Rare visitant. An adult male, showing no sign of moulting, was banded by J. H. Wilson at Leech Lake, July 21, 1945, and another adult male was banded by Mr. Wilson there on Oct. 17, 1945.

An adult female, banded by the writer on Aug. 10, 1945, at Rousay Lake, was shot Nov. 3, 1945, at Wallaceburg, Ont. Another adult female, this one in full moult and totally flightless when banded on Aug. 22, 1945 at Rousay Lake, was shot in November, 1945, Bath, Illinois. Frank Baines reports that C. H. Maddaford shot an individual of this species one fall, in the 1920's.

Gadwall.

Anas strepera.—Not common summer resident on sloughs and lakes, though fairly common at Sheho. This species was much more numerous in the 1920's. Earliest spring arrival, April 29, 1944 (W.N.). Average, May 3. Late fall departure, Oct. 26, 1943.

Pintail.

Anas acuta. — Very common summer resident. Other than the Mallard, this seems to be the only species of duck that has held its own over the years. Earliest spring arrival, March 24, 1945. Average, April 8. Late fall departure, Oct. 27, 1944. Early nest, 10 eggs, May 7, 1946. Early hatching, May 27, 1946. An adult female, banded Sept. 3, 1945, was found May 5, 1946 at St. Michael, Alaska.

Green-winged Teal.

Anas carolinense.—Regular, but not common, summer resident. Earliest spring arrival, April 26, 1941. Early nest, 4 eggs, May 13, 1946. One egg per day was laid until May 19, when the nest was destroyed by a predator. Broods of 7 and 2 young, 2 to 3 weeks old, July 23, 1946.

Blue-winged Teal.

Anas discors. — Very common summer resident. Earliest spring arrival, April 21, 1946. Average, May 1. Late fall departure, Oct. 7, 1943. That many flocks of this species may leave early enough to escape the hunting season is suggested by an immature female, banded Aug. 22, 1943, at Rousay Lake, which flew into a water tower at Chase, Kansas, Sept. 7, 1943. An immature female, banded Aug. 24, 1943, was shot at Lake St. Clair, Ont., Sept. 28, 1943. An immature male, banded Aug. 25, 1943, was shot in the fall of 1943, near Arecibo, Porto Rico. An immature male, banded Sept. 20, 1943, was shot Jan. 23, 1944, at Banta Habana, Cuba. Early nest, 9 eggs, May 19, 1946. Early hatching, June 18, 1946. Late record: female with brood no more than two days old, Aug. 2, 1946.

Cinnamon Teal.

Anas cyanoptera.—Rare straggler. Sight record of adult male by Frank Baines, one spring in the 1920's. Sight record within town limits of Melville (sloughs east of round house), May 25, 1941, by Louis T. McKim.

Male bird trapped and banded by J. H. Wilson at Leech Lake, June 16, 1944, was shot at Huntingdon Beach, California, Dec. 9, 1944.

Baldpate.

Mareca americana.—Common summer resident at Melville; fairly common at Yorkton; not common at Sheho. Earliest spring arrival, April 12, 1942. Average, April 20. An immature female banded at Rousay Lake, Sept. 16, 1944, was shot near Barahoha, Dominican Republic, Dec. 25, 1946. An adult male, banded at Rousay Lake, June 19, 1945, was shot Dec. 17, 1945, at Santa Clara, Cuba.

Shoveller.

Spatula clypeata.—Very common summer resident of shallow waters; not quite so common toward the northern limits of this area. Earliest spring arrival, April 19, 1946 (W.N.). Average, April 29.

Redhead.

Aythya americana.—Common summer resident on the larger sloughs and lakes. Numbers have decreased during the past three years. Earliest spring arrival, April 22, 1942 (W.N.). Average, April 27. Female flushed from recently-completed nest, no eggs, May 26, 1946. Nest, 11 eggs, June 8, 1946. Early hatching, June 16, 1946. Banding recoveries indicate that this species follows an easterly or southeasterly migration route. An immature female banded at Rousay Lake, July 31, 1944, was shot Oct. 24, 1944, at Lake St. Francis, Quebec. I have had several other recoveries from Ontario and Maryland.

Ring-necked Duck.

Aythya collaris. — Regular, but not common, migrant. Earliest spring arrival, April 26, 1940 (L.T. McK.). Average, May 2.

Canvasback.

Aythya valisineria.—Common summer resident on larger sloughs and lakes. Earliest spring arrival, April 13, 1943. (W.N.). Average, April 23. Late fall departure, Nov. 5, 1943. Early nest, 11 eggs, May 24, 1946. Early hatching, June 1, 1946. As this latter nest contained 15 eggs, laying must have begun in April. Banding recoveries include those from Maryland and North Carolina.

Lesser Scaup.

Aythya affinis.—Common summer resident on larger sloughs and lakes; very common during migration. Once rafted in countless thousands on Good Spirit Lake, but in recent years they have been noted in only a small fraction of their former numbers. Earliest spring arrival, April 11, 1943. Average, April 22. Latest fall departure, Nov. 11, 1944. Average (of 3), Oct. 27. Early nest, 11 eggs, June 8, 1946. Early hatching, June 23, 1946. Female still incubating, July 26, 1946.

Common Golden-eye.

Glaucionetta clangula. — Not common in migration at Yorkton, though fairly common at Sheho and Melville; rare summer resident. Earliest spring arrival, April 6, 1944 (W.N.). Average, April 15. A pair nested in a blind chimney 4 miles south of Yorkton, in 1924, 1925, 1926 and 1927. (This species is a regular nester at Madge and other lakes just north of the district covered by this paper.)

Bufflehead.

Glaucionetta albeola.—Not uncommon in migration, though I have few dates recorded. Earliest spring arrival, April 19, 1942. Late spring departure, small flocks of adult males, June 19, 1945. An adult male, banded at Rousay Lake, June 16, 1945, was shot at La Boguila, Chihuahua, Mexico, Jan. 24, 1946.

White-winged Scoter.

Melanitta fusca.—Fairly common summer resident on some of the deeper bodies of water, including York Lake, Crescent Lake, Anderson Lake at Saltcoats, and several lakes north of Sheho. Earliest spring arrival, May 8, 1939 (W.N.). Average, May 16.

Three pairs were noted on York Lake in July, 1944, the first time this species had been noted there since Ducks Unlimited restored its water level in 1943. In 1945, 10 pairs were present there, and in 1946, over thirty pairs. On July 13, 1947, 46 were counted in one flock. A nest with 10 eggs, on the ground at the base of a clump of willows, July 3, 1946, was located almost exactly half a mile from the nearest water (York Lake).

Ruddy Duck.

Oxyura jamaïcensis. — Fairly common on larger sloughs and lakes. Has decreased at Sheho in recent years. Earliest spring arrival, April 27, 1943. Average, May 2. Late fall departure, Oct. 24, 1942 and Nov. 7, 1943. Early nest, 6 eggs, June 19, 1946. Early hatching, June 26, 1946.

Hooded Merganser.

Lophodytes cucullatus. — Uncommon; two records. An adult female shot at Crescent Lake, mid-October, 1944, by Mr. John Smith,

was examined by the writer. J. H. Wilson banded a female of this species at Leech Lake, July 12, 1945.

American Merganser.

Mergus merganser. — Rather uncommon transient. May 4, 1940, at Hopkin's Lake, on west city limits of Yorkton. April 20, 1942, at Sheho. Between thirty and forty noted by L. T. McKim, April 29, 1945, at the C.N.R. Dam near Melville, in company with 1000 Scaup, 250 Canvasbacks, 25 Redheads and 25 Buffleheads, the largest aggregation of diving ducks he had ever seen. Adult banded by J. H. Wilson, July 22, 1944.

Red-breasted Merganser.

Mergus serrator.—One record: an adult male shot by Olie Sherwin on the Little Whitesand River near Yorkton, about 1933. He mounted the bird and it is at present in the possession of Wm. Bailey, Yorkton.

Turkey Vulture.

Cathartes aura.—Fairly common all summer from 1888 to about 1896, soaring above the margins of Good Spirit Lake. Since that time, Mr. Gunn has seen a few birds nearly every spring, including two birds noted in the spring of 1947. Fred Baines saw four or five at a dead beast near Crescent Lake in 1892, and Frank Baines saw one that was shot at Leech Lake. (They are present all summer at Crooked and Madge Lakes, just south and just north, respectively, of the area covered by this list.)

American Goshawk.

Accipiter gentilis.—An irregular, but often fairly common, winter visitor. More abundant than usual during winters of 1942-43 and 1943-44. Earliest fall arrival, Sept. 26, 1946 (W.N.).

Sharp-shinned Hawk.

Accipiter striatus. — Not uncommon in migration. Earliest spring arrival, April 7, 1943. Average, April 19.

Cooper's Hawk.

Accipiter cooperii. — Not uncommon in migration; uncommon summer resident. Since this species was on the Hypothetical List of Mitchell (1924), many have the erroneous impression that it is extremely rare in this province, and I shall therefore quote all available records for this district. March 28, 1944, May 5, 1945, and March 26, 1946, at Sheho (W.N.). April 28, 1945, near Yorkton (A. McPherson). May 17, 1942, near Good Spirit Lake (I.M.P.) Sept. 7, 1945, at Rousay Lake (I.M.P.) Sept. 24, 1944, south of Yorkton (I.M.P.) Oct. 12, 1942 (C.S.H.) Doubtful records for April 2, 1943 (C.S.H.) and for April 3, 1943, May 1, 1945, and Aug. 31, 1942 (I.M.P.).

A juvenile which entered a duck trap on dry land at Rousay Lake, was banded Aug. 30, 1945. A nest with 3 eggs, was found at Leech Lake by J. H. Wilson, May 28, 1945. An adult was sitting close on the eggs when W. H. Carrick visited the nest on June 8, 1945. Another nest with 3 eggs was found by members of the Yorkton Natural History Society at the west side of the "Muskeg", on June 10, 1947. It was 22 feet from the ground in a black (balsam) poplar. Misfortune befell one of the eggs, as there were only two young in the nest when the writer banded them on July 11.

Red-tailed Hawk.

Buteo jamaicensis.—Common summer resident. Earliest spring arrival, March 20, 1945. (W.N.). Average, April 2. Latest fall departure, Oct. 18, 1942. Average, Oct. 9. Nest with three fledglings, two-thirds grown, June 8, 1946.

Swainson's Hawk.

Buteo swainsoni. — Common summer resident wherever there are stretches of open country. Earliest spring arrival, May 8, 1943. Average (of 3), May 13. Nest, 3 fresh eggs, Rousay Lake, May 25, 1946. Young still in nest, Leech Lake, Aug. 5, 1944.

American Rough-legged Hawk.

Buteo lagopus. — Fairly common migrant, especially in spring. Earliest spring arrival, March 26, 1946. Average, April 1.

Ferruginous Rough-leg.

Buteo regalis.—Uncommon, though once a fairly common summer resident in open country; apparently its numbers have decreased considerably. One spring date—May 14, 1943. One fall date: Sept. 13, 1942.

Golden Eagle.

Aquila chrysaetos.—Rare migrant. Frank Baines shot three at different times in the 1910's, including one that had a 7'2" wing spread. L. T. McKim reports that two have been shot at Melville at different times. J. R. Foreman noted three flying over the west edge of Yorkton, Nov. 6, 1938. Another was noted

Fig. 2. The "Muskeg".

Fig. 3. Upper Rousay Lake.

by Mr. Foreman on April 6, 1943, flying in a northerly direction at a good height. A 'plane approached from the east and the eagle made a sudden dive to a lower level, apparently badly frightened.

Bald Eagle.

Haliaeetus leucocephalus.—Rare straggler. Individuals of this species were seen half a dozen times at Crescent Lake in the 1910's and 1920's, when fish were plentiful in the lake. One bird once brought a fish up onto a telephone pole near the deserted house of Frank Baines' father, and proceeded to devour the fish. John Gunn saw one flying south over Good Spirit Lake in late October, 1945. Mr. Gunn had previously seen them in spring migration two or three times over a period of nearly sixty years. Wm. Niven has two dates for this species: March 19, 1945, and Oct. 31, 1945. During the last twenty years, he has seen them on several other occasions in both spring and fall. One was shot at Bredenbury April 5, 1946.

Marsh Hawk.

Circus cyaneus hudsonius.—Very common throughout the district. Earliest spring arrival, March 18, 1945. Average, March 31. Latest fall departure, Nov. 11, 1944. Average (of 3), Nov. 3. Early nest, 2 eggs, Rousay Lake, May 29, 1946. This nest was a platform of bulrushes, possibly an old muskrat house or Canvasback nest, twenty inches in diameter, in eighteen inches of water. Three or four small twigs were used in the construction above water, and the nest was lined with grass.

Another Marsh Hawk nest at Lower Rousay Lake, had originally been in two inches of water, but was on dry land by the time the young hatched. This nest was of much better construction, being eighteen inches high and firmly constructed of interwoven twigs. It, too, was lined with grass. The long grass and rushes of the surrounding vegetation provided excellent cover and shade for the nest, and all three eggs produced young, which were banded June 20, just as they were ready to leave the nest. Within 50 yards of this nest were 9 waterfowl nests: 2 Mallard (one only 10 yds. distant), 2 Redhead, 1 Canvasback, 1 Blue-winged Teal (15 yds. distant), 1 Coot and 2 Lesser Scaup. Within the next 50 yards were an additional 9 nests. This was the thickest concentration of duck nests found during a summer's survey of waterfowl nests for Ducks Unlimited. Over half the nests were begun after the Marsh Hawk had started building its nest, so it would appear that ducks have little fear of the Marsh Hawk, at least before the young are hatched.

Prairie Falcon.

Falco mexicanus.—Rare. Single bird noted eight miles west of Springside, July 17, 1946, by Farley M. Mowat.

Peregrine Falcon.

Falco peregrinus. — Uncommon. May 26, 1945 (I.M.P.); June 2, 1945 (W.N.). One noted flying over, July, 1940 (I.M.P.) One noted July 18, 1944, at Rousay Lake by Mrs. Priestly and Dick Bird. One resting on a duck trap at Leech Lake, Aug. 5, 1944. Sept. 21, 1942, at Rousay Lake (C.S.H.) Oct. 21, 1942, at Good Spirit Lake (J. Gunn).

Pigeon Hawk.

Falco columbarius.—Noted quite regularly in migration. Earliest spring arrival, April 6, 1943 (W.N.). Average, April 21. Earliest fall arrival, Sept. 1, 1941. Average (of 3), Sept. 4. Latest fall departure, Sept. 28, 1942. Average (of 3), Sept. 25.

American Sparrow Hawk.

Falco sparverius.—Once common summer resident; now markedly decreased in numbers. Earliest spring arrival, March 26, 1946. Average, April 15. Heavy migration noted April 20, 1939. Late fall date, Sept. 7, 1945.

Ruffed Grouse.

Bonasa umbellus. — Once common year-round resident of wooded areas, but decreased as land was cleared. Markedly reduced in numbers since 1942.

Prairie Chicken.

Tympanuchus cupido.—Once a fairly plentiful resident of low, grassy flats. H. S. Swallow, who was very familiar with this species at Gladstone, Man., reports that there were a few scattered individuals in this district when he arrived in the fall of 1902. J. Gunn, R. P. Rooke, and Frank Baines all said "about 1905", when queried as to the date of their arrival. They were "common" in the Theodore district in the early 1920's (Brother S. Matthias), and were once fairly common, and nested, at Sheho. They once had one of their dancing grounds on the farm of William Niven, who reports that he has not seen an individual of this species since about 1926. After they had disappeared from the rest of the district, they were still present on the flats south of Rousay Lake and the flats west of Saltcoats. The

last definite record for the latter location is for a bird shot by Robt. Cock in the fall of 1942. They have not entirely disappeared from the district, as they are seen nearly every year south of Rousay Lake on the Otthon flats, W.D. Lightbody having seen three there in early November, 1946.

Sharp-tailed Grouse.

Pedioecetes phasianellus. — Common year-round resident at most times, though numbers fluctuate considerably. They have not yet recovered from the sharp decline which they experienced in 1942. Nest with 14 eggs under old tin stove on edge of Yorkton, June 7, 1940, hatched the following week.

Chukar Partridge.

Alectoris graeca.—A group were released at Melville in 1940. About 60 wintered there the first winter, while scattered reports of them came in from places 30 miles apart the next spring. Twelve birds were seen in the spring of 1942, near the Old Folks' Home, Melville. One pair were seen by John Kosa near Brewer in 1945.

Fifty were released by the Yorkton Fish & Game League in 1941, from which there have been only three reports: a female with young at Fonehill in 1944; one near Tonkin that year; one, 3 miles west of Yorkton in the spring of 1947.

Hungarian (Grey) Partridge.

Perdix perdix.—This species first appeared in this district about 1928, and quickly established itself. Common all year prior to 1942, though its decrease in numbers was probably more gradual at that time than was the case with the Sharp-tailed Grouse. Nest, 10 eggs, June 8, 1946.

Ring-necked Pheasant.

Phasianus colchicus. — A few individuals reached this district in 1940. The Yorkton Fish & Game League has released a few birds from time to time in the past four years. Though a few females have nested successfully in the wild state, they cannot yet be said to be securely established in this district.

Whooping Crane.

Grus americana.—R. P. Rooke reports that in the early 1890's, flocks of Whooping Cranes, numbering up to 20 or 30 individuals, flew over Rothbury settlement each spring. Frank Baines saw small flocks of up to 15 birds nearly every year in migration before the turn of the century, and occasionally they rested on the fields near Crescent Marsh.

About 1895, Jim Nelson shot a Whooping Crane, with sandy splashes on its neck, near Crescent Lake. This bird was skinned by Frank Baines, and sent to E. J. Cousins, a Toronto collector. The present whereabouts of the specimen are unknown. Robt. Rousay shot four in the field just north of his house on the edge of Rousay Lake, about 1896. They were noted regularly in migration there at that time. John A. Gunn saw this species only once—a pair in a meadow south of Good Spirit Lake, seen in the spring of about 1890. W. G. Sharpe shot a Whooping Crane which flew low over his pit while he was hunting geese near Crescent Lake in the fall of 1924. At the time it was thought locally that this bird might have been the last in existence. In the fall of 1942, John Domon saw a single bird in a flock of Sandhills, at Rokeby Marsh.

Sandhill Crane.

Grus canadensis. — Greatly decreased in numbers, but still a regular migrant and a rare summer resident. Earliest spring arrival, April 12, 1944. Average, April 21. Three fall dates: Sept. 2, 1942; Sept. 8, 1945 (33 birds); Sept. 15, 1943.

John Gunn reports that they were plentiful all summer at Good Spirit Lake for about the first eight years after 1888, and that he found one nest, 2 miles south of the lake, about 1890. Robt. Rousay says they were a regular and common breeder around Rousay Lake in the 1890's, and were even commoner near Rokeby Marsh.

Frank Baines' father shot two in 1884, near Crescent Marsh. One of these birds, when hung up by the bill, measured exactly six feet from the tip of its bill to the ends of its toes, and would therefore almost certainly be referable to be *G. c. tabida,* the Greater Sandhill Crane. One spring day in the 1890's, Fred Baines found three Crane nests, each with two eggs, on sec. 20, twp. 23, range 3, west 2nd mer., at the south edge of Crescent Marsh. Another time, the Baines found a nest in the McNichol slough, sec. 34, twp. 23, range 2, west 2nd mer., or about one mile south and two miles west of the town of Saltcoats. The latest nest with eggs that they remember is one found on July 1 in the 1890's, in a slough in the middle of an undeveloped road allowance, one mile east and over two miles south of Yorkton, by Frank Baines.

Dr. Lawrence H. Walkinshaw of Battle Creek, Michigan, has examined a female Little Brown Crane, with nest and eggs, in the Museum of Comparative Zoology, Harvard Col-

lege, Cambridge, Mass., and labelled as having been collected by Fred Baines at Crescent Lake, on May 27, 1899. The eggs were both very small and dark and the female had an exposed culmen of 84 mm. and a tarsus of 191 mm., evidently referable to *G. c. canadensis*, the Little Brown Crane. Mr. Fred Baines recollects having collected a set of eggs, and a female as she left the same nest, that summer. The only doubtful part of this record is that the specimen passed through the hands of Walter Raine, whose records are no longer accepted.

Raine (1892) states: "One set of two eggs collected at Crescent Lake on May 20th, 1890, measures 3.60 x 2.30 and 3.64 x 2.32. The nest was found on a sandy knoll in a marsh, and was a large structure of broken-down reeds and aquatic plants; the bird was flushed off the nest. Another set of two eggs in my collection from Crescent Lake only measure 3.56 x 2.28 and 3.59 x 2.30. They were collected on May 16th, 1890." Again these eggs were undoubtedly collected by Fred Baines, but the record cannot be accepted with complete confidence.[2]

R. P. Rooke knew of only one place in this district where the Sandhill Cranes bred in quantity. This was in the "Ravine", about one mile west and three miles south of where the village of Willowbrook is today. This ravine was about 1½ miles long and 200 yards wide at the bottom. It had no stream in it, but at several places some hundreds of yards apart, there were springs which welled up through low muskegy hillocks, to form niggerhead marshes from 100 to 200 yards in diameter. Around each of these marshes grew a wide belt of bulrushes and reeds. On one occasion, almost certainly in June, 1893, Mr. Rooke made a fairly thorough search of this area and found 10 nests, each with two eggs in it.

Fred G. Bard, now Director of the Saskatchewan Provincial Museum, reports that a pair were present at Rokeby Marsh, apparently nesting, in June, 1941. He searched for the nest, but was unable to find it in the few hours at his disposal. Mr. McInnes of Rokeby found five nests on the west side of Rokeby Marsh, between 1938 and 1940. John Domon, on the east side of the Marsh, has never found a nest, but has seen young Cranes. From reports of other farmers around the Rokeby Marsh, it seems almost certain that Cranes have nested there each year, including 1947.

Frank Baines' son found a Crane's nest with two destroyed eggs in McNichol's slough, in 1942. His father had found nests in this same slough some fifty years before (*vide supra*). E. C. (Cub) Major of Wroxton came upon an adult crane and two small young ones on high ground on the edge of a farm, 5 miles south, and 3 miles west of Calder, about June 20, 1945.

Virginia Rail.

Rallus limicola.—Two dark juvenile birds of this species noted at the "Muskeg", July 17, 1942, by Mrs. Priestly.

Sora Rail.

Porzana carolina.—Common summer resident in marshes. Earliest spring arrival, May 2, 1946. Average, May 12. Early nest, 9 eggs, June 20, 1946. Early hatching, June 24, 1946.

American Coot.

Fulica americana.—Very common summer resident on sloughs and lakes. Earliest spring arrival April 25, 1943. Average, May 1. Latest fall departure, Oct. 19, 1942. Average (of 3), Oct. 17. Early nest, 2 eggs, May 23, 1946. Early hatching, June 11, 1946. An individual of this species, banded Sept. 14, 1943, was shot at Pedro, Jamaica, in December, 1943, and another, banded Aug. 27, 1944, was shot at Amarillas, Matanzas, Cuba, on Nov. 8, 1944.

Piping Plover.

Charadrius melodus.—Rare. One nesting pair, south shore of Good Spirit Lake, noted on June 23, 1936, by J. Dewey Soper. Good Spirit Lake, 1938 (J. Gunn). York Lake, May 29, 1939 (I.M.P.) Noted at Sheho, May 3, 1942, and May 10, 1943 (W.N.).

Semipalmated Plover.

Charadrius hiaticula.—Rather uncommon migrant. Single bird at Melville, May 23, 1943. (L.T. McK.). May 21, 1939, May 21, 1942, and June 9, 1947 at Sheho (W.N.). June 7, 1942 at York Lake (I.M.P. and C.S.H.). Leech Lake, July 17, 1496 (Farley M. Mowat and C.S.H.). Good Spirit Lake, July 26, 1938 (I.M.P.). York Lake, Aug. 21, 1941 (I.M.P.).

Killdeer.

Charadrius vociferus.—Common in vicinity of grassy uplands and sloughs throughout the

[2] Raine (1892, p. 167) again lists these sets of eggs as Set I and I respectively. Shufeldt examined a set of eggs purchased from Raine the data label of which stated that they are set II as recorded by Raine (loc. cit.). Shufeldt (1896, Nidologist, p. 148) says of them, "These eggs, however, measure nothing of the kind... In other words, they are not the eggs of **Grus canadensis** at all, but they are the eggs of **Grus virgo, and markedly small eggs even for that species**"! — Ornith. Ed.

district. Earliest spring arrival, March 23, 1945. Average, April 5. Latest fall departure, Sept. 27, 1942. Average (of 3), Sept. 25.

American Golden Plover.

Pluvialis dominica. — Rather uncommon migrant. York Lake, May 14, 1939. Seventy-five seen at slough within Melville town limits by L. T. McKim, May, 1944. Also noted at Leech Lake by J. H. Wilson in May, 1944. May 29, 1945 at Sheho.

Black-bellied Plover.

Squatarola squatarola.—Rather uncommon migrant, though commoner in migration farther west. April 24, 1939 and May 27, 1943 at Sheho. (W.N.). Goose Lake, May 19, 1940. York Lake, June 7, 1942. Small flocks of 25 to 50 birds noted each day at Leech Lake from May 19 to June 1, 1945 (W.H. Carrick).

Ruddy Turnstone.

Arenaria interpres.—Uncommon migrant. May 15, 1940 at the C.N.R. Dam, Melville (L.T. McK.). York Lake, May 26, 1946.

Wilson's Snipe.

Capella gallinago.—Not uncommon in vicinity of larger marshes. I have only two spring arrival dates: April 28, 1945 and May 3, 1942. One fall departure date: Oct. 26, 1943.

Long-billed Curlew.

Numenius phaeopus. — (Hypothetical). — Rare. York Lake, May 22, 1938 (I.M.P.). I am not acquainted with the details of this observation, and so tend to accept it with reservations.

Hudsonian Curlew.

Numenius phaeopus. — (Hypothetical). — Noted at Melville by L. T. McKim, May 20, 1945. It flew almost at once, passing very close to Mr. McKim. The decurved bill was only of medium length, and appeared much too short for the bird to belong to the previous species.

Upland Plover.

Bartramia longicauda. — Fairly common summer resident on grassy uplands bordering the larger bodies of water. Forty years ago this species was common throughout the district. It disappeared almost entirely during the 1930's, but has been fairly common at Sheho since about 1940. Earliest spring arrival, April 27, 1940. Average, May 6. Early nest, Rousay Lake, 3 eggs, June 8, 1946, had 4 eggs the following day. Young bird, several days old, June 27, 1947, at Rousay Lake.

Spotted Sandpiper.

Actitis macularia.—Not common but probably breeds sparingly in this district. Earliest spring arrival, May 14, 1939. Average (of 3), May 17. Fall date, Sept. 7, 1942.

Solitary Sandpiper.

Tringa solitaria.—Not uncommon in migration. Earliest spring arrival, April 22, 1946 (W.N.). Average (of 5), May 5. Fall arrival: July 29, 1944 and July 30, 1943. Latest fall departure, August 23, 1942. Average (of 3), August 20.

Willet.

Catoptrophorus semipalmatus. — Common summer resident in vicinity of sloughs and lakes. Earliest spring arrival, April 23, 1943 and 1945 (W.N.). Average, April 27. Latest fall departure, Sept. 12, 1940. Average (of 3), Sept. 2.

Greater Yellowlegs.

Totanus melanoleucus.—Noted especially, late in fall migration. Earliest spring arrival, April 7, 1943. Average (of 4), April 28. Latest fall departure, Oct. 30, 1940. Average (of 4), Oct. 26.

Lesser Yellowlegs.

Totanus flavipes.—Common migrant. Earliest spring arrival, April 20, 1942 (W.N.). Average, April 28. Noted at "Muskeg", July 1, 1940, and July 21, 1941.

Pectoral Sandpiper.

Erolia melanotos.—Common in migration. Earliest spring arrival, April 21, 1942 (W.N.). Average, May 1. Late spring date, May 23 (L.T. McK.). Earliest fall arrival, July 17, 1938. Late fall departures: Sept. 10, 1942, and Sept. 24, 1941.

White-rumped Sandpiper.

Erolia fuscicollis.—Rather uncommon migrant. June 1, 1941, at the "Muskeg". Large flock seen at Melville, May 23, 1943 (L. T. McK.). Fair numbers at Leech Lake, late May, 1945. (W. H. Carrick).

Baird's Sandpiper.

Erolia bairdii.—Apparently not uncommon in migration. Spring dates: May 19, 1942 (I.M.P.); May 23, 1943 (L. T. McK.).

Least Sandpiper.

Erolia minutilla.—Common in migration. Earliest spring arrival, May 19, 1943. Average, May 22. Late spring departure, June 7, 1942.

Red-backed Sandpiper.

Erolia alpina.—Not common migrant. May 22, 1940, at the C.N.R. Dam, Melville (L. T. McK.). One or two seen during a period of two weeks from May 24 to June 7, 1945, by W. H. Carrick at Leech Lake.

Dowitcher.

Limnodromus griseus.—Fairly common in migration. Earliest spring arrival, May 15, 1940. Average (of 3), May 20. Late spring date, June 7, 1942. Earliest fall arrival, July 17, 1946.

Stilt Sandpiper.

Micropalama himantopus.—May 22, 1940 at the C.N.R. Dam, Melville, (L. T. McK.). May 24, 1945, at York Lake (A. McPherson). July 17, 1946, at Leech Lake (Farley M. Mowat and C.S.H.).

Semipalmated Sandpiper.

Ereunetes pusillus.—Common migrant; apparently more common than the Least, but differentiation between these two species is often difficult. Earliest spring arrival, May 15, 1940. Average, May 24. Late spring date, June 7, 1942. Earliest fall arrival, July 21, 1941.

Marbled Godwit.

Limosa fedoa.—Common summer resident in vicinity of sloughs and lakes. Earliest spring arrival, April 21, 1943. (W.N.). Average, April 27. Early nest, 1 egg, May 25, 1946. An individual of this species, banded at Leech Lake by J. H. Wilson, August, 1944, was picked up dead at Oxnard, north of Los Angeles, California, in December, 1944.

Hudsonian Godwit.

Limosa haemastica.—Rare migrant; two records. Patrick Farm Slough, May 14, 1939 (I.M.P.). Leech Lake, May 25, 1945 (J. H. Wilson).

Sanderling.

Crocethia alba.—Seen occasionally in migration at Melville (L. T. McKim). Only two Yorkton records: June 6, 1945 and Oct. 4, 1944, both at York Lake.

American Avocet.

Recurvirostra americana.—Uncommon summer resident. Earliest spring arrival, May 19, 1940 (at Goose Lake). Average (of 3), May 23. Eight pairs nested on a gravelly island in Leech Lake in company with Ring-billed Gulls, June, 1945 (W. H. Carrick). A flock of 20 present on a small alkali slough near Sheho during the summer of 1945, the only time that Wm. Niven has seen this species.

Wilson's Phalarope.

Steganopus tricolor. — Common summer resident on sloughs. Earliest spring arrival, May 8, 1944 (W.N.). Average, May 20. Early nest, 4 eggs, Rokeby Marsh, May 31, 1945 (W. H. Carrick).

Northern Phalarope.

Lobipes lobatus.—Rather uncommon migrant. May 18, 1940 and June 7, 1942. Large flocks were noted on Leech Lake, May 29 to 31, 1945 by W. H. Carrick. On the peak day, May 30, well over 500 birds were present in one flock. Just a few stragglers were noted the next day.

Herring Gull.

Larus argentatus.—Common migrant, apparently breeding farther north. Except under favorable conditions, easily confused with the next two species. Earliest spring arrival, April 5, 1943. Average, April 13. Fall arrival, Sept. 27, 1941 and 1942. Fall departure, Oct. 20, 1942 and Oct. 21, 1941.

California Gull.

Larus californicus.—(Hypothetical) — One doubtful record: York Lake, 1938 (I.M.P.).

Ring-billed Gull.

Larus delawarensis.—Not uncommon summer resident in vicinity of lakes. Earliest spring arrival, April 21, 1945 (A. McPherson). Late fall departure, Oct. 26, 1940. Average, Oct. 13. Two nests on gravelly island in Leech Lake, July, 1944 (J. H. Wilson), and one nest on same island, June, 1945 (W. H. Carrick); may also nest at Horseshoe Lake.

Franklin's Gull.

Larus pipixcan. — Common summer resident. Earliest spring arrival, April 13, 1944. Average, April 21. Latest fall departure Sept. 20, 1938. Average (of 3), Sept. 12.

Common Tern.

Sterna hirundo. — A bird of the larger bodies of water, noted chiefly in migration. Present in summer at Madge Lake. Fairly common at Good Spririt Lake, June 23, 1936 (J. Dewey Soper). Spring dates at Sheho: April 21, 1942, May 17, 1940 and May 12, 1943 (W.N.) Noted near Yorkton on Aug. 18, 1943 (I.M.P.). Has been noted at Crescent Lake. Two were noted at York Lake, July 17, 1947.

Fig. 4. Salt Lake near Sheho.

Fig. 5. Large Slough near Beaverdale.

Black Tern.

Chlidonias nigra.—Abundant summer resident in vicinity of marshes. Earliest spring arrival, May 12, 1940. Average, May 17. Latest fall departure, Aug. 23, 1942. Average (of 3), Aug. 21. Early nest, 3 eggs, June 8, 1946. Early hatching, downy young in nest, July 1, 1946.

Mourning Dove.

Zenaidura macroura.—Fairly common summer resident in vicinity of marshes. R. P. Rooke noted this species in this district only on rare occasions in the 1890's. It seems it showed a considerable increase in the fifteen or twenty years prior to 1944, but showed a decrease in 1945 from which it has not yet recovered. Earliest spring arrival, April 21, 1944 (W.N.). Average, May 2. Latest fall departure, Oct. 30, 1939. Average (of 4), Oct. 7. Nest, 2 eggs, July 7, 1944.

Black-billed Cuckoo.

Coccyzus erythropthalmus. — Not common summer resident. This species seemed to reach its peak in numbers when all the poplar trees in the district were heavily infested with tent caterpillars (1940-1942). Quite common at Sheho until 1944; since then, Mr. Niven has had only one record: one bird seen on June 27, 1947. Earliest spring arrival, May 24, 1941. Average, June 1. Vernon S. Barnes and the writer watched an egg hatch (the last of the three in the nest), June 28, 1940, on Wallace Ave., Yorkton. Another nest, this time with 4 young, was found within the Yorkon city limits on July 13, 1941.

American Screech Owl.

Otus asio.—Rare, but apparently a year-round resident. Mrs. Priestly believed she heard a bird of this species, at the "Muskeg", April 8, 1940. A small owl, apparently of this species, was sitting on the rafters in the Yorkton Skating Rink, Jan. 25, 1941. Dulmage's Farm, beside the "Muskeg", Feb. 22, 1941. Yorkton, Feb. 18, 1942 (I.M.P.). One captured in a garden of Yorkton, on Nov. 15, 1945, was banded and released. A small owl, probably of this species, was lifted from a hole in a hollow tree, containing one white egg, on the eastern outskirts of Yorkton, by Jim Allen, May, 1946.

Great Horned Owl.

Bubo virginianus. — Fairly common, year-round resident. Nest with newly hatched young, near Lower Rousay Lake, March 21, 1946, reported by E. S. Wood. Incubation in this instance began in February (the thermometer dipped at least to zero (F.) every day that month.) One young bird left this nest on June 8, 1946. Nest with one egg at Crescent Lake, March 6, 1945 (J. Hagel). Nest with eggs at the "Muskeg", April 7, 1940.

Snowy Owl.

Nyctea scandiaca. — Irregular, but often common, winter visitor, usually more numerous in late fall and early spring. Earliest fall arrival, Nov. 7, 1942. Latest spring departure, April 7, 1940. Plentiful, winters of 1939-40 and 1942-43. Fairly common, winter of 1943-44.

Hawk Owl.

Surnia ulula. — Two found dead near St. Joseph's College, Yorkton, winter of 1938 (Brother Clarence). One shot about 1902 by Frank Baines.

Burrowing Owl.

Speotyto cunicularia.—Uncommon summer resident of open prairie. Nested 3 miles south and 2 miles west of Saltcoats, for several years in succession, about 1938. Nested, 5 miles east and 2 miles north of Yorkton, from 1940 to 1945 (J. R. Foreman). L. T. McKim reports the nesting of three pairs in the Melville region. The writer found a nest containing five young, 3 miles east of Melville, July 9, 1947.

Long-eared Owl.

Asio otus. — Not uncommon summer resident of bluffs, though it used to be more common. Early nest, 3 eggs, May 18, 1946. Another nest had four young and one egg on May 18, 1946, and five young the following day.

Short-eared Owl.

Asio flammeus. — Fairly common summer resident of damp meadows, some years. Spring dates: April 25, 1943, and May 11, 1945. One winter record: January, 1940, near Togo (J. R. Foreman). Frank Baines has found several nests on the flats south-east of Crescent Marsh.

Saw-whet Owl.

Aegolius acadicus. — Rare. One shot by George Markham near Yorkton, about 1930, was mounted and is now in the possession of T. Groom, Yorkton. One noted, and specimen taken, by Jim Rogerson while taking a Christmas Bird Census, 6 miles west of Saltcoats, Dec. 31, 1942. One noted, Jan. 26 and Feb. 11, 1943 at Sheho. (W.N.).

Whip-poor-will.

Caprimulgus vociferus.—Now only a rare straggler. Heard calling at Good Spirit Lake by J. Gunn, July, 1943, the second time he had heard this species in thirty or forty years. This species was common when he and his parents first settled at Good Spirit Lake in 1888, and for about twenty years following, it remained common in the bush and waste land along the gulches and on the south side of the sand hills, west of his home. One heard calling every night from a bush some two miles north of Rousay Lake in 1889 (Robt. Rousay). Frank Baines heard this species calling at Crescent Lake on three separate occasions before the turn of the century. One heard in the Assiniboine valley, east of Yorkton by J. R. Foreman in 1938 and another was heard and seen near the Foremans' home, Yorkton, one evening, probably in the summer of 1938. One heard near Yorkton, July, 1941, by Mrs. M. J. Culver.

Nighthawk.

Chordeiles minor.—Common summer resident, nesting on flat gravel roofs where available. Earliest spring arrival, May 19, 1939 (W.N.). Average, May 25. Latest fall departure, Sept. 4, 1942. Average, Sept. 1. Early nest, 1 egg, June 28, 1940.

Ruby-throated Hummingbird.

Archilochus colubris.—Fairly common summer resident, frequenting flower gardens. Earliest spring arrival, May 18, 1941. Average, May 29. Nest located, 1943, near Buchanan. Latest fall departure, Sept. 23, 1942. Average (of 3), Sept. 15.

Belted Kingfisher.

Megaceryle alcyon.—Not common. J. Gunn reports that kingfishers were present at Good Spirit Lake until about 1927, when the minnows disappeared from the lake. They were most often noted along the creek leading from the lake, when it was running, about 1922. Half a dozen pairs were present, and almost surely nested, at Crescent Lake from about 1909 to 1923, when fish were plentiful in the lake. Wm. Niven found a pair nesting along the creek banks just east of Sheho, about 1924. Now noted only as an irregular migrant, except possibly along the Whitesand River, where a few pairs may still nest. Early spring dates: April 30, 1943, and May 5, 1945. Fall dates: Aug. 27, 1947 (along Cussed Creek); Sept. 1, 1941; Sept. 18, 1942; Sept. 6, 1944; Sept. 26, 1943.

Yellow-shafted Flicker.

Colaptes auratus. — Common summer resident. Earliest spring arrival, April 9, 1943 (W.N.). Average, April 17. Latest fall departure, Sept. 25, 1938. Average, Sept. 19. Early nesting, May 12, 1946. Young from this nest were able to fly on June 26, 1946.

Pileated Woodpecker.

Hylatomus pileatus.—A bird of the northern woods, occuring at Crystal Lake, just north of the area covered by this list. J. Gunn noted only two individuals at Good Spirit Lake in sixty years; one of these was seen in autumn of about 1936, the other in the spring of about 1942. Also one noted by M. Heintz, in the springs of 1940 and 1941, on a telephone pole in front of the Yorkton Collegiate (unverified).

Red-headed Woodpecker.

Melanerpes erythrocephalus. — Rare straggler. One noted, June, 1936 (I.M.P.). One noted for one day only at Sheho, July 6, 1946 (W.N.).

Lewis's Woodpecker.

Asyndesmus lewisi. — One shot by Frank Baines, sec. 24, twp. 23, range 3, west 2nd mer., about 3 miles south and 6 miles west of Saltcoats, about 1920. Mr. Baines knew he had never seen this species before, and checked the identification very carefully in his bird books.

Yellow-bellied Sapsucker.

Sphyrapicus varius.—Fairly common migrant; breeds sparingly. Earliest spring arrival, April 25, 1945 (A. McPherson). (Six other records at intervals to June 23, Average, May 21). Brother S. Matthias reports that it was common in the big timber of the Beaver Hills country south of Theodore in the early 1920's. Nest found at Good Spirit Lake, 1938 (I.M.P.).

Hairy Woodpecker.

Dendrocopos villosus.—Apparently not so common as the Downy Woodpecker at Yorkton, though this situation is reversed at Sheho. A year-round resident, but more apparent in winter in towns and farmyards. A female of this species, banded by E. Robinson at East Bay, Man., Jan. 12, 1935, was killed at Good Spirit Lake, Aug. 15, 1938.

Downy Woodpecker.

Dendrocopos pubescens.—A fairly common year-round resident, also more apparent in winter.

Arctic Three-toed Woodpecker.

Picoides arcticus. — (Hypothetical) — Rare straggler. One doubtful record, either this or the next species, for Aug. 11, 1940 (I.M.P.).

American Three-toed Woodpecker.

Picoides tridactylus. — (Hypothetical) — Rare straggler. One record for Yorkton, Sept. 15, 1942 (C.S.H.). An excellent view of the yellow crown cap, was obtained but I did not note the dorsal markings with certainty, but I felt quite sure that it did not have a solid black back.

Eastern Kingbird.

Tyrannus tyrannus.—Common summer resident. Earliest spring arrival, May 13, 1941 (W.N.). Average, May 19. Latest fall departure, Sept. 7, 1938 (a family which did not leave the nest until August 28). Average fall departure, Sept. 1.

Arkansas Kingbird.

Tyrannus verticalis.—Not common throughout most of this area, but gradually extending its range northward. First appeared in Melville in 1924, and for four years running, nested behind a can on an electric light pole and raised a family each year. At the time they were the only representatives of their species in the district, though they gradually became common in Melville. One pair nested on the farm of Robt. Mess, 5 miles west of Bredenbury, in 1937. First noted nesting in Yorkton and Saltcoats, June, 1940; then increased to become quite common in Yorkton in 1942, but has since shown a decrease. Two records for Sheho: June 7, 1942, and June 9, 1946. Earliest spring arrival, June 1, 1942. Average (of 5), June 9. Two fall dates: Aug. 23, 1942 and Aug. 22, 1943.

Eastern Phoebe.

Sayornis phoebe. — Not common summer resident. Earliest spring arrival, April 18, 1943 (W.N.). Average, April 30. Early nest, York Lake, May 24, 1945.

Yellow-bellied Flycatcher.

Empidonax flaviventris. — Rather uncommon migrant. June 3, 1943, at the "Muskeg" (I.M.P.—close-up view obtained). Has also been noted in migration by J. R. Foreman.

Alder (Traill's) Flycatcher.

Empidonax traillii.—Probably a not uncommon summer resident in willow thickets along creeks. Noted along Little Whitesand River, July 2, 1942.

Least Flycatcher.

Empidonax minimus. — Common summer resident. Earliest spring arrival, May 15, 1941. Average, May 21. Latest fall departure, Sept. 2, 1943. Average, Aug. 29.

Richardson's Pewee.

Contopus richardsonii.—Uncommon summer resident. Early spring arrival, May 20, 1945. Several summer records indicate breeding birds: July 30, 1938, at Good Spirit Lake; heard and seen in Yorkton, July 1 and 16, 1940 and July 28, 1941.

Olive-sided Flycatcher.

Nuttallornis borealis.—Several records during spring migration: May 22, 1938, at York Lake; June 23, 1940, in Assiniboine Valley; June 5 and 6, 1943, on western outskirts of Yorkton; May 25, 1945, at the "Muskeg".

Horned Lark.

Eremophila alpestris. — Common summer resident of open fields. There are three winter records, Jan. 24, 1942 (W.N.). C. Stuart Francis saw a Horned Lark, Jan. 25, 1945, 18 miles south of Yorkton, and was told that it had already been around the yard for ten days or more. Two were seen in Wm. Niven's farmyard, near Sheho, Dec. 31, 1945. Average spring arrival, Feb. 28. Two fall dates: Oct. 14, 1942, and Oct. 15, 1944.

Tree Swallow.

Iridoprocne bicolor.—Common summer resident. Earliest spring arrival, April 22, 1946 (W.N.). Average, April 28. Fall dates: Sept. 7, 1942, and Sept. 1, 1944. Nest, 2 young, June 13, 1943.

Bank Swallow.

Riparia riparia. — Common summer resident wherever suitable nesting sites are available. Earliest spring arrival, May 5, 1945. Average, May 14. Late fall date, Sept. 12, 1938. Average (of 3), Sept. 5.

Barn Swallow.

Hirundo rustica.—Very common summer resident. Frank Baines reports that he did not find this species in this district when he arrived in 1883. It first appeared at, or just before, the turn of the century. Earliest spring arrival, April 30, 1942 (W.N.). Average, May 10. Late fall departure, Oct. 2, 1943. Average (of 5), Sept. 22.

Cliff Swallow.

Petrochelidon pyrrhonota. — Uncommon summer resident. Earliest spring arrival, May

22, 1938. Average (of 4), May 24. Frank Baines reports that around 1900, nearly every barn in the district, including his own, had nesting Cliff Swallows. At that time, there were between 25 and 40 nests on the side of one barn. Mr. Baines has not seen a nest of this species for about ten years. Brother S. Matthias reports a colony near Caldervale School, in 1919. J. R. Foreman visited a colony of about 200 adults on the side of a barn, 18 miles west and 3 miles north of Yorkton in 1942. That year he noted also a colony of about 600 at a farm, 2 miles north of Sheho. This latter colony had nearly 2,000 adults in 1946, but only about 200 in 1947, according to Mr. Foreman. George Niven substantiates Mr. Foreman's statement that about 2,000 birds were present most of the summer in 1946, but he believes that only a fraction of them actually nested there.

Purple Martin.

Progne subis. — Fairly common summer resident; its numbers seem to be increasing as more bird houses are erected. Earliest spring arrival, April 24, 1941. Average, May 3. Latest fall departure, August 28, 1941. Average (of 3), Aug. 22. Nested in the wild at Frank Baines' farm at Crescent Lake from 1938 to 1943. Also nests in hollow trees at Leech Lake: one nest, in a dead stub 18 ft. high, with opening in top, contained 5 young and 1 egg, at depth of one foot, on July 15, 1946. A few pairs nest in old flicker holes in a bluff behind Wm. Niven's farmyard at Sheho.

Canada Jay.

Perisoreus canadensis.—Noted some winters, as a wanderer from its breeding grounds just north of this district. J. Gunn reports that this species was so common in the fall and winter before the turn of the century that it was a nuisance to the trappers at Good Spirit Lake. It was quite common also at Crescent Lake in winter in the early days, and even up until about 1935, Frank Baines noted one or two nearly every winter. Two noted at Yorkton, Feb. 18, 1937, and three on March 7, 1942. (E. Lloyd). Two were present in Yorkton during the winter of 1945-46, making numerous visits to the feeding station of J. R. Foreman, and one of them was noted during the Christmas Bird Census, Dec. 26, 1945. Another was noted during the Christmas Bird Census, Dec. 26, 1946. Noted Nov. 8, 1944, at Sheho by Wm. Niven (the first record for many years though this species was once common there in winter). Two were noted at Sheho, Aug. 10, 1946 and were noted at intervals (sometimes 3 birds together) until Dec. 10, 1946. Two or three were present near J. Gunn's home at Good Spirit Lake, all through the winter of 1946-47.

Blue Jay.

Cyanocitta cristata. — Uncommon year-round resident; most evident during fall wanderings. J. Gunn reports that a number were present at Good Spirit Lake about 1937, but that he has not noted any since about 1944. Nesting in spruce tree, Yorkton, May, 1946. Nest, 3 young, in Frank Baines' back yard in Saltcoats, early June, 1944.

Steller's Jay.

Cyanocitta stelleri.—Rare straggler. Frank Baines reports that a pair resided on a farm, sec. 28, twp. 22, range 2, west 2nd mer., about 8 miles south and 4 miles west of Saltcoats, one summer in the 1920's. The birds were obviously jays, with prominent crests, and were dark blue in color. Mr. Baines checked the details with his bird books at the time, and is quite positive of his identification. He has never seen them at any other time.

Miss Pauline Summers got a close-up view of this midnight-blue visitor at the sandpit, Yorkton, in the spring of 1944. Previously, for about two months, officers of the Yorkton Natural History Society were repeatedly told of a "different kind of Blue Jay", notice having been drawn to it in most cases by its strident call.

Magpie.

Pica pica.—Fairly common year-round resident. J. Gunn reports that it was common near Good Spirit Lake for the first ten years after his arrival in 1887. It then practically disappeared for about thirty years, but has been increasing in numbers of later years.

Raven.

Corvus corax.—Rare straggler. Quite common at Good Spirit Lake during the winters from the time Mr. Gunn arrived (1888) until the district became settled, some ten years later. One noted at Cussed Creek, Oct. 9, 1938 (I.M.P.). One noted at Good Spirit Lake, Oct., 1939 (J. Gunn). One seen regularly for three weeks in August, 1944, at Leech Lake by J. H. Wilson in the early morning feeding on such carrion as dead shorebirds. One noted at Yorkton, Jan. 26, 1947, by Gordon Betker.

American Crow.

Corvus brachyrhynchos. — Very common summer resident. Earliest spring arrival, March 14, 1945. Average, March 22. Latest fall departure, Oct. 11, 1943. Average (of 3), Oct. 7. Early nest, 5 eggs, May 7, 1946. Early hatching, 4 young, May 28, 1946.

Black-capped Chickadee.

Parus atricapillus. — Common in winter. Present, and breeding, but less evident in summer. Frank Baines found two nests on his farm in the 1930's. Decidedly scarcer, winter of 1945-46.

Hudsonian (Brown-headed) Chickadee.

Parus hudsonicus. — One noted, Christmas Bird Census at Ituna, Jan. 1 to Jan 3, 1947, by Mrs. Isobel Arndt.

White-breasted Nuthatch.

Sitta carolinensis. — Not common; noted chiefly in fall. April 22, 1945; August 21, 1940; Sept. 23, 1942. Two noted at J. R. Foreman's feeding station, Yorkton, during Christmas Bird Census, Dec. 26, 1945.

Red-breasted Nuthatch.

Sitta canadensis. — Uncommon migrant; only records to date are for fall migration; Sept. 19, 1937; Oct. 4, 1941; Oct. 5, 1941—one picked up dead; Oct. 28, 1942; Oct. 17, 1943.

Brown Creeper.

Certhia familiaris.—Occasional. April 28, 1940; April 27, May 3, and May 14, 1942, with a well-marked migration on the latter date; July 9, 1943, Yorkton (I.M.P.) November, 1938 (J.R.F.); Sept. 23, 1942 (I.M.P.); Aug. 31, 1946 (A. E. Smith).

House Wren.

Troglodytes aëdon.—Common summer resident. Earliest spring arrival, May 11, 1942 (W.N.). Average, May 16. Latest fall departure, Sept. 17, 1943. Average (of 5), Sept. 14.

Long-billed Marsh Wren.

Telmatodyytes palustris.—Not uncommon summer resident in bulrushes around larger sloughs. Early spring dates, May 11, 1941, and May 23, 1942. Early nest, 7 eggs, Lower Rousay Lake, June 11, 1946.

Short-billed Marsh Wren.

Cistothorus platensis. — Several noted by Farley M. Mowat and the writer, Rokeby Marsh, July 19, 1946. Apparently a small nesting colony. Habitat in damp grass bordering marsh.

Catbird.

Dumetella carolinensis.—Common summer resident. Earliest spring arrival, May 18, 1943. Average, May 22. Latest fall departure, Sept. 28, 1942. Average, Sept. 20.

Brown Trasher.

Toxostoma rufum.—Common summer resident. Earliest spring arrival, May 1, 1946 (W.N.). Average, May 12. Latest fall departure, Sept. 12, 1944. Average, Sept. 7. Nest with 4 eggs, June 26, 1940.

American Robin.

Turdus migratorius. — Abundant summer resident. Earliest spring arrival, March 19, 1938. Average, April 4. Latest fall departure, Oct. 30, 1938. Average, Oct. 22. Nest with 2 eggs, May 1, 1944. A robin wintered near the spring at the "Muskeg", 1940-41. Another was seen at close range by three observers from St. Joseph's College, Yorkton, Dec. 27 and 28, 1944. J. Gunn reported one wintering at Good Spirit Lake, Christmas, 1945. Another robin was observed at Ituna, Dec., 1946, and was noted in the Christmas Bird Census, Jan. 1 to 3, 1947, by Mrs. Isobel Arndt.

Hermit Thrush.

Hylocichla guttata. — Fairly common in spring migration; less so in fall migration. Wm. Niven believes they once nested at Sheho years ago. Abundant, springs of 1939 and 1940. Earliest spring arrival, April 20, 1938. Average, May 3. Fall date: Sept. 25, 1944 (W.N.).

Olive-backed Thrush.

Hylocichla ustulata.—Fairly common migrant, particularly in spring. A heavy wave went through on May 14, 1940. Earliest spring arrival, May 5, 1945. Average, May 13. Fall date: Sept. 28, 1942.

Willow Thrush.

Hylocichla fuscescens.—Common summer resident in heavier bush. Earliest spring arrival, May 19, 1942 and 1943. Average, May 21.

Eastern Bluebird.

Sialia sialis.—Rather uncommon; no nesting records as yet. April 18, 1942 (J. Rogerson). April 25, 1942, at Sheho (Wm. Niven's first record of this species). March 25, 1945. (I.M.P.). March 31, 1946, and April 24, 1947, at Sheho (W.N.).

Mountain Bluebird.

Sialia currucoides—Common in migration, but a rather uncommon summer resident. Frank Baines does not remember seeing any individuals of this species before about 1930. Earliest spring arrival, March 18, 1945 (Ray Adam). Average, April 1. Latest fall departure, Oct. 11, 1944. Average (of 3), Oct. 6. Reported nesting 6 miles south of Yorkton, 1942. A pair nested and raised two broods, in an iron pipe protecting the guy wire of an electric light pole in Yorkton during the summer of 1942. A pair nested in a crack in the side of Wm. Niven's barn at Sheho in 1946. Nested in Dave Baines' mail box, Crescent Lake district, 1947.

Townsend's Solitaire.

Myadestes townsendi.—Rare straggler. One record: Yorkton, Oct. 24, 1940 (I.M.P.).

Ruby-crowned Kinglet.

Regulus calendula.—Thus far noted only in spring migration. Earliest spring arrival, April 26, 1942 and 1943. Average, May 1.

American Pipit.

Anthus spinoletta. — Uncommon migrant. Earliest spring arrival, April 27, 1944 (W.N.). Average (of 5), May 2. Fall dates: Sept. 16, 1945 (W.N.) and Oct. 4, 1944.

Sprague's Pipit.

Anthus spragueii. — Summer resident of grassy flats at Leech and Lower Rousay Lakes. One spring date: May 8, 1945 (A. McPherson).

Bohemian Waxwing.

Bombycilla garrulus.—Common, though irregular, winter visitor. Fewer than usual during winter of 1943-44. Earliest fall arrival, Oct. 15, 1941. Average (of 6) Nov. 1. Late spring dates: April 7, 1939 and April 8, 1943.

Cedar Waxwing.

Bombycilla cedrorum. — Common summer resident. This species was not common during the summer of 1941, but was quite numerous the following year. Earliest spring arrival, May 26, 1939. Average, June 1. Latest fall departure, Oct. 27, 1944. Average (of six) Oct. 14. Late nest, with 3 young, Sept. 5, 1947.

Northern Shrike.

Lanius borealis. — Rare winter visitor. Springside, 1938 and Nov. 11, 1944 (I.M.P.) December, 1942 and Jan. 23, 1945 at Sheho (W.N.).

Common Shrike.

Lanius ludovicianus. — Common summer resident. J. Gunn believes they have become rather scarce at Good Spirit Lake in the last six or seven years. Earliest spring arrival, April 28, 1943. (W.N.). Average, May 2. Latest fall departure, Sept. 19, 1944. Average (of 3), Sept. 16. Early nest, Leech Lake, 1 egg, May 28, 1945. This nest had 6 eggs on June 4. (W. H. Carrick).

Common Starling.

Sturnus vulgaris.—Not yet common, but increasing in numbers; year-round resident. Pool Elevator Bredenbury, May, 1938. Two wintered at Crescent Lake and specimen collected by Frank Baines, Feb. 18, 1941. Pair wintered on Dave Stearn's farm, Willowbrook, winter of 1941-42 and ten or twelve wintered on the same farm, winter of 1942-43. One bird in flock of blackbirds, Sept. 1, 1944, at Rousay Lake. Starlings appeared in the Sheho district, April 16, 1944, and several pairs nested in trees on the farm of Wm. Niven, appropriating old nesting holes formerly used by Purple Martins. Starlings have yet to winter at Sheho but they have arrived fairly regularly each spring, as follows: March 18, 1945; March 15, 1946; March 24, 1947. A flock of 20 Starlings were noted 4 miles east of Yorkton, March 13, 1945. Five were noted during a Christmas Bird Census at Yorkton, Dec. 26, 1945. Two noted Dec. 29 and 30, 1946, at Yorkton. May 14, 1945, on south side of Yorkton.

Blue-headed Vireo.

Vireo solitarius. — Rare. Yorkton, May, 1936 (I.M.P.). Noted at Melville, by L. T. McKim, Sept. 20, 1941, and Sept. 24, 1943. (Noted at Madge Lake, just north of the area covered by this list, July 30, 1939 (I.M.P.). (Noted June 3, 1945, just south of this area, by Elaine Culbert at Gerald, Sask.)

Red-eyed Vireo.

Vireo olivaceus. — Not common summer resident. Earliest spring arrival, May 13, 1941. Average, May 22. Noted at Southwood Golf Course, Yorkton, July 1, 1942. Several observed at Good Spirit Lake, June 23, 1936, by J. Dewey Soper. Mr. Niven believes this species nests at Sheho. L. T. McKim reports it as a very common species throughout the summer at Crooked Lake, just south of the area covered by this list. Late fall dates: Sept. 18, 1942 and Sept. 17, 1943.

Philadelphia Vireo.

Vireo philadelphicus.—One found dead at Yorkton, June 5, 1945, and identified by Mrs. Priestly.

Warbling Vireo.

Vireo gilvus.—Common summer resident. Earliest spring arrival, May 18, 1939. Average, May 24. Late fall departure, Sept. 9, 1942. Average (of 3), Sept. 7. Singing on nest, June 14, 1942.

Black and White Warbler.

Mniotilta varia.—Fairly common in migration. Earliest spring arrival, May 8, 1938. Average, May 15. Noted at Good Spirit Lake, Aug. 6, 1938. (Apparently nests at Madge Lake, just north of the area covered by this list.)

Tennessee Warbler.

Vermivora peregrina. — Rather uncommon migrant. May 22, 1938. May 15, May 24, and June 7, 1945. May 23, 1946 (W.N.). Several noted, May 17, 1947 (W.N.).

Orange-crowned Warbler.

Vermivora celata.—Rather uncommon migrant. May 22, 1938 (I.M.P.). May 5, 1945 (A. McPherson).

Nashville Warbler.

Vermivora ruficapilla.—Rather uncommon migrant. May 12, 1940 (I.M.P.). June 3, 1945 (A. McPherson).

Yellow Warbler.

Dendroica petechia.—Common summer resident. Earliest spring arrival, May 10, 1942 and 1945 (W.N.). Average, May 15. Latest fall departure, Sept. 6, 1937. Average (of 3), Sept. 3. Nest with 4 young, June 26, 1940.

Magnolia Warbler.

Dendroica magnolia. — Rather uncommon migrant. May 26, 1939, and May 24, 1942, at Sheho (W.N.). May 23, 1943. Many noted in the spring of 1945, from May 26 to June 5, and one was picked up dead on the latter date. Due to the unusual snowfalls and prolonged cold wet weather during late May and early June, 1945, the warbler migration was detained at Yorkton, giving an excellent opportunity for observing many species of warblers. In addition, the birds were extremely weak and relatively large numbers of several species were found dead throughout the district.

Cape May Warbler.

Dendroica tigrina.—Rather uncommon migrant. May 21, 1940 (C.S.H.). May 19, 1945 (I.M.P.). May 17, 1946 (C. C. Shaw).

Myrtle Warbler.

Dendroica coronata. — Common migrant. Earliest spring arrival, April 14, 1943 (W.N.). Average, April 26. Latest spring departure, May 22, 1938. Earliest fall arrival, Sept. 9, 1946. Average, Sept. 11. Latest fall departure, Oct. 14, 1944. Average, Oct. 2.

Black-throated Green Warbler.

Dendroica virens.—Rare migrant. Noted in migration at Sheho, 1927 (W.N.). Yorkton, May 7, 1945 (I.M.P.). (Noted as apparently nesting at Madge Lake, just north of this district, July 28, 1941—I.M.P.).

Blackburnian Warbler.

Dendroica fusca. — Rare migrant. Good Spirit Lake, 1938 (J. R. Foreman).

Chestnut-sided Warbler.

Dendroica pensylvanica. — Rare migrant. June 3, 1945 on west side of Yorkton (A. McPherson). June 2, 1945 at Sheho (W.N.).

Bay-breasted Warbler.

Dendroica castanea.—Rare migrant. May 26, 1939 and May 26, 1945 at Sheho (W.N.).

Black-polled Warbler.

Dendroica striata.—Not common migrant, though fairly common some years. May 22, 1938; May 22, 1944; May 12, 1945 (W.N.); May 24, 1945; May 12, 1946 (W.N.); May 26, 1946; May 17, 1947 (W.N.).

Palm Warbler.

Dendroica palmarum. — Fairly common in migration some years; apparently absent in others. Little Whitesand River, May 22, 1938. Noted at Sheho in 1927, and not seen again until May 12, 1944. May 5, 1945 at Sheho and May 8 and 13, 1945, at Yorkton. A heavy migration, May 4 to 18, 1946, was noted at Yorkton and Sheho, and was probably general throughout the district, and perhaps throughout the Province (it was also marked at Nipawin). May 25, 1947 (W.N.).

Oven-bird.

Seiurus aurocapillus. — Rather uncommon migrant. May 24, 1927 and May 17, 1938 at Melville. May 19, 1945 (A. McPherson). One trapped and banded, June 3, 1945. Sept. 22, 1931 at Melville (L. T. McKim). This

species is a summer resident at Madge Lake, just north of the district covered by this list.

Northern Water-thrush.

Seiurus noveboracensis. — Not uncommon migrant. Earliest spring arrival, May 10, 1945 (W.N.). Average (of 4), May 12. Fall arrivals: Aug. 18, 1945 and Aug. 31, 1946. Fall departures: Aug. 25, 1945 and Sept. 4, 1946.

Connecticut Warbler.

Oporornis agilis.—Rare migrant. An adult male captured beating against a downtown store window in Yorkton by Eddie Lawrence, June 2, 1945, was banded by the writer. June 6, 1945, near the "Muskeg" (A. McPherson).

Mourning Warbler.

Oporornis philadelphia. — Rather uncommon migrant, though usually in fair numbers when present. Sept. 1941 and Sept. 13, 1942 (I.M.P.). June 4, 1945 (A. McPherson).

Western Yellow-throat.

Geothlypis trichas.—Fairly common summer resident in vicinity of most marshes, though noted only in migration at Sheho. Especially numerous in 1942. Earliest spring arrival, May 8, 1938. Average (of 4), May 22. Latest fall departure, Sept. 22, 1941. Average (of 3), Sept. 18.

Wilson's Warbler.

Wilsonia pusilla.—Not uncommon migrant at Sheho; rather uncommon at Yorkton. Earliest spring arrival, May 12, 1941. Latest spring arrival, June 9, 1947. Average spring arrival, May 21.

Canada Warbler.

Wilsonia canadensis.—Rare migrant. June 5, 1945 (A. McPherson).

American Redstart.

Setophaga ruticilla.—Fairly common spring migrant; seldom noted in fall. More common in migration prior to about 1935, according to Frank Baines. Earliest spring arrival, May 20, 1944. Average, May 26. One fall date: Aug. 18, 1940.

English Sparrow.

Passer domesticus.—Abundant year-round resident.

Bobolink.

Dolichonyx oryzivorus. — Fairly common summer resident of damp meadows. Once fairly common at Sheho and nested there, but now scarce, with no records since June 17, 1942. Definite increase noted in the vicinity of Yorkton during 1942. Earliest spring arrival, May 24, 1939 (W.N.). Frank Baines has found nests of this species near Crescent Lake, and he reports that Bobolinks were more common prior to 1930.

Western Meadowlark.

Sturnella neglecta. — Abundant summer resident of pastures and fields. Earliest spring arrival, March 21, 1946. Average, April 1. Latest fall departure, Oct. 30, 1938. Average, Oct. 14. Early nest, 4 eggs, May 20, 1946. A meadowlark wintered on the farm of a neighbor of Wm. Niven's at Sheho, late in 1942, until it disappeared about New Years, possibly killed by a cat.

Yellow-headed Blackbird.

Xanthocephalus xanthocephalus. — Fairly common summer resident of larger marshes. This species was common at Sheho until 15 years ago, but has been rare since. Frank Baines reports that it was about three times as common near Crescent Lake until about 1930. Earliest spring arrival, May 4, 1942. Average, May 10. Fall dates: Sept. 10, 1943 and Sept. 1, 1944. Early nest, 4 eggs, June 12, 1946.

Red-winged Blackbird.

Agelaius phoeniceus.—Abundant summer resident in vicinity of sloughs. Earliest spring arrival, March 24, 1945. Average, April 8. Last fall departure, Oct. 15, 1944. Average, Sept. 30. Early nest, 5 eggs, June 1, 1946. Early hatching, June 12, 1946. One reported wintering near spring at the "Muskeg", winter of 1940-41. Another individual of this species wintered at the same place, 1944-45, and was noted Dec. 22 and 31, 1944 and Jan. 27, 1945. Towards the end of March, he could be heard calling continuously from the top of a tall cottonwood.

Baltimore Oriole.

Icterus galbula. — Common summer resident. Earliest spring arrival, May 12, 1939. Average, May 19. Latest fall departure, Sept. 6, 1939. Average (of 4), Sept. 3.

Bullock's Oriole.

Icterus bullockii.—Rare. A pair noted regularly about the bushes near J. R. Foreman's home on Wallace Ave., Yorkton, during the summer of 1940. Several close-up views of these birds were obtained by Mr. Foreman, though a nest was not found.

Rusty Blackbird.

Euphagus carolinus. — Noted chiefly in fall. Common late fall migrant at the "Muskeg". One spring record: April 23, 1944 (I.M.P.). Earliest fall arrival, Oct. 3, 1943. Average, Oct. 7. Latest fall departure, Nov. 8, 1942. Average, Oct. 30.

Brewer's Blackbird.

Euphagus cyanocephalus. — Common summer resident in country districts. Earliest spring arrival, March 23, 1945 (W.N.). Average, April 13. Latest fall departure, Nov. 11, 1942. Average (of 4), Nov. 2. An albino of this species was noted by Mrs. J. R. Foreman near Wroxton, Aug. 8, 1942, among a flock of normally colored Brewer's Blackbirds. About Sept. 10, 1942, Mrs. J. Pierce, of Rokeby, when driving to Yorkton, also saw a perfectly white bird, possibly the same bird, among a flock of about 30 or 40 blackbirds.

Bronzed Grackle.

Quiscalus quiscula. — Very common summer resident in towns; less common in country districts. Earliest spring arrival, April 1, 1945. Average, April 14. Latest fall departure, Oct. 8, 1943. Average (of 3), Oct. 4.

Cowbird.

Molothrus ater. — Common summer resident. Earliest spring arrival, May 3, 1943. Average, May 10. Fall dates: Sept. 4, 1943 and Sept. 10, 1944.

Scarlet Tanager.

Piranga olivacea. — (Hypothetical) — "Reported from Assiniboine Valley near Togo"— Blue Jay, Vol. 4, p. 6. Without a date, or the name of the observer, I cannot accept this record.

Rose-breasted Grosbeak.

Pheucticus ludovicianus. — Fairly common summer resident of the heavier bush, near Yorkton. Wm. Niven sees it only in migration at Sheho. Earliest spring arrival, May 15, 1941. Average, May 21. Frank Baines once found a nest of this species, about 1918.

Indigo Bunting.

Passerina cyanea.—One record: near Good Spirit Lake, April 27, 1941 (W. A. Tripp).

Dickcissel.

Spiza americana.—Rare straggler. One record for Melville, Sept. 4, 1942, a bird flitting about inside an open garage. Mr. McKim obtained a very good view of the bird as it perched for half a minute at a time on various places in the garage, seeming not to notice the open doors.

Evening Grosbeak.

Hesperiphona vespertina. — Erratic winter visitor. Very common at Yorkton in the early spring (Feb. 18 to April 14) of 1937, when there was a heavy southward movement of this species across the prairies. A few noted, Yorkton, March 14 to April 9, 1939. Noted March 22, 1939, March 25, 1943 and March 25, 1944 at Sheho (W.N.). Noted Oct. 31, 1946, at Sheho, the forerunners of the flocks that were noted throughout the district that winter, and noted during the 1946 Christmas Bird Censuses at Ituna and Sheho.

Common Purple Finch.

Carpodacus purpureus. — Common in migration. Earliest spring arrival, April 14, 1944 (W.N.). Average, April 22. Earliest fall migration, Sept. 13, 1942. Average (of 3), Sept. 20. Latest fall departure, Oct. 3, 1940. Average (of 4), Sept. 28.

Pine Grosbeak.

Pinicola enucleator.—Fairly regular winter visitant. Very common in 1939 and 1941. Common, Feb. 18 to 28, 1940. Scarce, winter of 1943-44. Earliest fall arrival, Sept. 30, 1942. Latest spring departure, March 12, 1942.

Hoary Redpoll.

Acanthis hornemanni.—Probably a rather uncommon winter visitor, usually accompanying flocks of the Common Redpoll. April 15, 1942, at Sheho and April 12, 1942, at Yorkton.

Common Redpoll.

Acanthis flammea. — Common in late fall and early spring, and throughout the winter if the snowfall is not too heavy. Earliest fall arrival, Oct. 2, 1943. Average, Oct. 15. Latest spring departure, May 14, 1939.

Pine Siskin.

Spinus pinus.—Uncommon migrant. May 29 and June 5, 1943. July 4, 1945. Oct. 14, 1944, July 6, 1945 and Sept. 24, 1946, at Sheho (the latter flock stayed about two weeks). A small flock was noted July 19, 1947 at Sheho, and 35 were on the writer's lawn, in Yorkton, on Aug. 3, 1947.

American Goldfinch.

Spinus tristis.—Common summer resident. Earliest spring arrival, May 17, 1941 (W.N.). Average, May 24. Latest fall departure, Oct. 14, 1940. Average (of 4), Oct. 8.

Red Crossbill.

Loxia curvirostra. — (Hypothetical) — A crossbill, believed to be of this species, was killed by a cat in the spruce tree by the window of J. Gunn's home at Good Spirit Lake in January or February, 1944.

White-winged Crossbill.

Loxia leucoptera.—Rare and erratic winter visitor. One picked up dead, April 3, 1938 at Yorkton. One caught in Wm. Niven's barn, Sheho, winter of 1939 (W.N.). An adult female was picked up dead in Yorkton, June 7, 1947.

Spotted Towhee.

Pipilo maculatus. — Rare. One record: Good Spirit Lake, June 26, 1938 (I.M.P.).

Lark Bunting.

Calamospiza melanocorys. — Occasionally wanders into this district, the southern border of which forms roughly the northern limits of its range at this longitude. L. T. McKim has three records, as follows: June 3, 1934 and June 12, 1935, near Old Folks' Home, Melville, and a male noted at Melville, May 28, 1944.

Savannah Sparrow.

Passerculus sandwichensis.—Common summer resident in vicinity of marshes. Earliest spring arrival, April 28, 1946 (W.N.). Average, May 3.

Baird's Sparrow.

Ammodramus bairdii.—Uncommon. One picked up dead at Rousay Lake, Aug. 17, 1944. A juvenile caught and banded at Rousay Lake, July 24, 1945. Noted at Sheho, May 28, 1944, June 8, 1945 and June, 1946 (W.N.).

Leconte's Sparrow.

Passerherbulus caudacutus. — (Hypothetical)—Sight records for Sheho, May 4, 1942 and May 4, 1945 (W.N.). Both Mrs. Priestly and the writer have several records for this species in their books, but each entry has a query beside it.

Nelson's Sharp-tailed Sparrow.

Ammospiza caudacuta.—Noted at Hopkins Lake, Yorkton, May 5, 1945 (A. McPherson). Perhaps this inconspicuous little sparrow is fairly common in certain areas, and only awaits more careful observation.

Vesper Sparrow.

Pooecetes gramineus. — Common summer resident. Earliest spring arrival, April 17, 1946 (W.N.). Average, April 26. Latest fall departure, Oct. 4, 1944. Average (of 4), Oct. 2. Nest, 4 eggs, May 23, 1946. Nest, 2 young, June 8, 1943.

Slate-colored Junco.

Junco hyemalis.—Very common in migration. Earliest spring arrival, March 20, 1945. Average, April 2. Latest spring departure, May 8, 1945. Earliest fall arrival, Sept. 15, 1943. Average, Sept. 19. Latest fall departure, Nov. 10, 1942. Average, Nov. 5.

Tree Sparrow.

Spizella arborea. — Common in migration. Earliest spring arrival, March 22, 1946 (W.N.). Average, April 6. Earliest fall arrival, Sept. 20, 1937. Average, Oct. 6. Latest fall departure, Nov. 5, 1944. Average, Oct. 23.

Chipping Sparrow.

Spizella passerina. — Fairly common summer resident at Yorkton and Melville; not very common at Sheho. Earliest spring arrival, April 19, 1942 (W.N.). Average, May 5. Fall date: Sept. 4, 1938.

Clay-colored Sparrow.

Spizella pallida. — Very common summer resident. Earliest spring arrival, May 3, 1946. Average, May 10. Latest fall departure, Sept. 26, 1943. Average, Sept. 18.

Harris's Sparrow.

Zonotrichia querula. — Fairly common in migration. Earliest spring arrival, May 1, 1938. Average, May 10. Late spring date: May 22, 1938. Earliest fall arrival, Sept. 15, 1942. Average (of 4), Sept. 19. Latest fall departure, Oct. 18, 1942. Average, Oct. 13. Unusually large numbers passed through in the fall of 1942.

White-crowned Sparrow.

Zonotrichia leucophrys.—Common in migration most years. Very common, spring of 1938; scarce, spring of 1939. Earliest spring arrival, April 28, 1946 (W.N.). Average, May 5. Earliest fall arrival, Sept. 12, 1946. Average (of 4), Sept. 16. Late date: Sept. 25, 1938. Birds caught for banding purposes have proved to be *Z. l. gambeli*, Gambel's Sparrow.

White-throated Sparrow.

Zonotrichia albicollis.—Common in migration. Earliest spring arrival, April 25, 1942. Average, May 1. Earliest fall arrival, Sept. 7, 1941. Average, Sept. 12. Latest fall departure, Oct. 12, 1942. Average, Oct. 8. Very scarce, spring of 1939. Present during sum-

mers of 1939 and 1940 at Yorkton, possibly breeding. Heard singing, believed nesting, at Sheho, during June and the first week of July, 1947.

Fox Sparrow.

Passerella iliaca.—Fairly common in migration at Yorkton, many years. Once common in migration at Sheho, but has not been noted for years. Very common, April, 1941. Earliest spring arrival, April 15, 1942. Average (of 5), April 20. Late spring date, May 10, 1945. Earliest fall arrival, Sept. 26, 1941. Average (of 3), Sept. 28. Latest fall departure, Oct. 10, 1937 and 1938. Average, Oct. 7.

Lincoln's Sparrow.

Melospiza lincolnii.—Common, but inconspicuous, in migration. Earliest spring arrival, April 28, 1945. Average, May 3. One doubtful fall record, Sept. 16, 1940.

Swamp Sparrow.

Melospiza georgiana. — Apparently a not common, but regular, migrant. Earliest spring arrival, April 28, 1945. Average (of 5), May 3. Earliest fall arrivals, Sept. 18, 1942 and Sept. 22, 1944. Latest fall departures, Oct. 3, 1942, 1943 and 1944 and Sept. 28, 1941. One picked up dead, Oct. 10, 1937.

Song Sparrow.

Melospiza melodia.—Very common summer resident at Yorkton; fairly common at Sheho. Earliest spring arrival, April 6, 1943. Average, April 15. Late fall departure, Oct. 27, 1944. Average (of 3), Oct. 14. Early nest, 4 eggs, May 27, 1946. Early hatching, June 16, 1946 (two nests with 3 and 4 young, respectively).

McCown's Longspur.

Rhynchophanes mccownii. — One record: just west of Melville, May 25, 1935 (L. T. McKim).

Smith's Longspur.

Calcarius pictus.—A spring and fall migrant on the fields of Wm. Niven's farm, 6 miles north of Sheho, first noted from Sept. 24 to Oct. 14, 1944 (flocks of 200-300). Also noted May 4, 1945; March 27, 1946; and April 17, 1947; and Sept. 1, 1945; and Sept. 9, 1946, at Sheho. The latter record was for a flock of 50 to 100 birds which remained for three or four weeks.

Lapland Longspur.

Calcarius lapponicus.—Fairly common migrant. Earliest spring arrival, March 29, 1940. Average, April 15. Latest spring departure, May 19, 1940. Earliest fall arrival, Sept. 21, 1944. Average (of 6), Sept. 28. Late date: Oct. 9, 1938.

Chestnut-collared Longspur.

Calcarius ornatus.—Not common summer resident of grassy fields. Several pairs nest at Rousay Lake and a small nesting colony was noted at Sheho, 1942 and 1943. Earliest spring arrival, May 10, 1945 (W.N.). Average, May 16.

Snow Bunting.

Plectrophenax nivalis. — Very common winter visitant, except when the snow covers all available weeds, etc. Earliest fall arrival, Sept. 28, 1942. Average, Oct. 11. Late spring departure, May 19, 1940.

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BOOK REVIEWS

Know Your Ducks and Geese. *By Angus H. Shortt and B. W. Cartwright. Sports Afield Publishing Co., Minneapolis, Minn., 1948, size ca. 14½ x 12 inches, no pagination, 36 color plates, 38 black and white drawings, 36 range maps. Padded leatherette binding, $5.00 (U.S.A.).*

This handsome volume is intended primarily to familiarize sportsmen with the waterfowl they hunt. Thirty-six species of ducks and geese are treated. For each species there is a section devoted to a description of the adults in flight and on the water, with emphasis on diagnostic field characters; northward and southward migration; courtship and nesting; food habits, tables of weights including both extremes and averages for male and female; breeding and wintering distributions; and, for those who wish to read further, there are lists of references to appropriate literature. The text, by Cartwright, is on glassine paper seperating the colored plates.

Breeding and wintering ranges of each species are indicated also on small maps. In the few instances, as in the breeding range of the greater scaup, where these are not strictly in accord with ranges given in the text the difference appears to be due mainly to the difficulty of mapping ranges the distributional details of which are not yet completely available. However the Arctic islands are not included in the map showing the breeding range of the old-squaw but this information is given in the written summary.

The nuptial plumage of both sexes of each species treated is very attractively illustrated by Shortt and these water colors are well reproduced on heavy paper. The large size of the plates *(ca.* 8¼ x 10½ inches) permits illustration of plumage details, even coloration of the 'soft parts'. Shortt's first-hand knowledge of waterfowl in the field is reflected in his usually lifelike flight postures of these birds and his background compositions are uniformly pleasing. — W. EARL GODFREY.

Proposed Amendment to the Constitution of THE OTTAWA FIELD-NATURALISTS' CLUB

The Secretary,
Ottawa Field-Naturalists' Club.
Dear Mr. Secretary:

I hereby give notice to the Council of the Ottawa Field-Naturalists' Club that at the next annual meeting of the Club I shall move that the Constitution be amended by the deletion of all the present text and the substitution of the revised text arrived at by the Council. I append hereto a copy of the revised text.

(Signed) FARRELL E. BANIM
St. Patrick's College,
Ottawa.
September 27, 1949.

CONSTITUTION OF THE OTTAWA FIELD-NATURALISTS' CLUB

Articles of the Constitution

1.—Name.
2.—Objects.
3.—Membership.
4.—Publication Fund.
5.—Officers.
6.—The Council.
7.—Auditors.
8.—Meetings.
9.—Elections.
10.—Term of Office.
11.—Quorum.
12.—Duties of the President.
13.—Duties of the Vice-Presidents.
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18.—Affiliated Societies.
19.—Amendments.
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Article 1. NAME

This Club shall be known as THE OTTAWA FIELD-NATURALISTS' CLUB.

Article 2. OBJECTS

The objects of this Club shall be: to foster an acquaintance with and a love of nature; to encourage investigation and to publish results of original research and observations in all fields of natural history.

Article 3. MEMBERSHIP

a) *Active Members:* Anyone interested in natural history may, upon application, be elected by the Council an Active Member of the Club. Payment of the annual fee shall be a necessary condition of the continuance of membership.

b) *Associate Members:* Any resident of the Ottawa District who is interested in natural history may, upon application, be elected by the Council an Associate Member of the Club. Associate Members shall receive notification of, and be eligible to participate in, such activities of the Club as shall be agreed upon by the Council.

c) *Corresponding Members:* Any eminent Naturalist not resident in Canada may be elected by the Council a Corresponding Member.

d) *Life Members:* Upon payment of a fee set in the by-laws in one payment, any Active Member or other person elected to the class by the Council may become a Life Member.

e) *Sustaining Life Members* shall be those persons or institutions from each of which the Club has accepted the sum of $100.00 in one payment for such membership.

f) *Benefactors* shall be those persons or institutions from each of which the Club shall accept the sum of $500.00 or more.

g) *Honorary Members:* Any prominent person resident in Canada, who has to a marked degree assisted towards the successful working of the Club, may be elected by the Council an Honorary Member. There shall not be at any one time more than five such Honorary Members.

h) *Patrons:* The Council shall have power to elect a Patron or Patrons, not to exceed two in number at any one time, after his (or their) consent has been obtained.

i) *Privileges of Members:* Sustaining Life Members, Life Members, Corresponding Members, and Honorary Members shall be entitled to receive the publications of the Club for life, and Benefactors, whether persons or institutions, shall be entitled to receive the publications of the Club.

Article 4. PUBLICATION FUND

The Club shall maintain a permanent fund to be known as The Publication Fund. All dues for Benefactorship, Sustaining Life Membership, Life Membership, and bequests not directed by the donor to be used otherwise,

and all gifts specifically intended for this Fund shall be paid into and included in this Fund.

Article 5. OFFICERS

The Officers of the Club shall be a President, a First and a Second Vice-President, a Secretary, a Treasurer, an Editor, and a Business Manager.

Article 6. THE COUNCIL

The Council shall consist of the Officers of the Club and such other members as the Club may elect. Upon retirement of any President of the Club from office, he shall continue a member of the Council for the ensuing Club year. Presidents of affiliated societies shall be ex officio members of the Council.

The Council shall meet from time to time at the call of the President or of any two other of its members; it shall manage all matters affecting the welfare of the Club; it shall have control of the funds of the Club; and it shall present at the Annual Meeting a report upon the year's work. This report shall be published in The Canadian Field-Naturalist.

Article 7. AUDITORS

Two Auditors shall be elected by open vote at the Annual Meeting. They shall examine the Treasurer's accounts and certify as to their correctness.

Article 8. MEETINGS

The Annual Meeting of the Club shall be held in December.

A special meeting of the Club may be called by the Secretary on the request of ten active members. At this meeting no business other than that for which the meeting was called shall be transacted except by unanimous decision of those present.

Article 9. ELECTIONS

The President, the two Vice-Presidents, the Secretary, the Treasurer, and the other members of the Council, shall be elected by ballot at the Annual Meeting or at a special meeting.

The Council shall, at the earliest possible date, appoint the Editor and the Business Manager from among the members of the Club.

The Council shall have power to accept any resignations and to appoint any member of the Club to fill any vacancies occurring during the Club year.

None but Active Members, Life Members, Sustaining Life Members, and Benefactors shall have a vote or be eligible for any of the above elections or appointments.

Article 10. TERM OF OFFICE

The Officers, the other members of the Council, and the Auditors, shall assume office at the close of the meeting at which they are elected or appointed, and shall hold office until the end of the next Annual Meeting, or until their successors are appointed.

Article 11. QUORUM

Twenty members shall constitute a quorum at the Annual Meeting or at any other business meeting of the Club, and five members shall constitute a quorum of the Council.

Article 12. DUTIES OF THE PRESIDENT

The President shall preside at meetings of the Club and of the Council. He shall conduct all business of the Club in accordance with its constitution and by-laws. He shall be, ex-officio, a member of all committees of the Council and of the Club.

Article 13. DUTIES OF THE VICE-PRESIDENTS

In the absence of the President, or, at his request, a Vice-President shall, in order of rank, act in his stead.

Article 14. DUTIES OF THE SECRETARY

The Secretary shall keep a true record of the proceedings of the Club and of the Council, and shall conduct their correspondence. He shall give previous notice to each member of the Council of its various meetings. He shall be the custodian of the constitution and by-laws and of the records of the Club. He shall be the compiler of the Annual Report of the Council and shall read it at the Annual Meeting of the Club.

Article 15. DUTIES OF THE TREASURER

The Treasurer shall be charged with the collection and custody of the moneys of the Club and shall keep a systematic account thereof which shall at any time be open to the inspection of the Council or of the Auditors. He shall make disbursements only when authorized by the by-laws or by decision of the Council. He shall submit at each Annual Meeting a statement showing the financial standing of the Club.

Article 16. THE OTTAWA DISTRICT

The Ottawa District shall be the area included within a radius of thirty miles of the National War Memorial in the City of Ottawa.

THE CANADIAN FIELD-NATURALIST

Article 17.

The Canadian Field-Naturalist is the organ of the Club. It shall be issued as directed by the Publications Committee and a copy shall be sent to patrons and to every active member of the Club and to every subscriber to the publication.

All contributions published in The Canadian Field-Naturalist shall be in harmony with the objects of the Club, the decision of the Publications Committee on such matters being final.

Associate Editors shall be appointed by the Council.

Article 18. AFFILIATED SOCIETIES

Affiliated Societies are those organizations which have been accepted for affiliation by the Council. The annual affiliation fee, and publication privileges in The Canadian Field-Naturalist, shall be fixed by the Council.

Article 19. AMENDMENTS

An amendment to this constitution may be made at an Annual Meeting of the Club by a two-thirds vote of the active members present, notice having been sent to the Secretary, who shall present it at a meeting of the Council at least two months previous to such Annual Meeting, or to the Club at a previous Annual Meeting. Notification of a proposed amendment shall be published in The Canadian Field-Naturalist at least one month before the Annual Meeting at which a vote on the amendment is to be taken.

Article 20. BY-LAWS

The Council may make such by-laws as are not inconsistent wtih the provisions of the articles of this Constitution.

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